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Architectural Copyright.

THOSE who are interested in the progress of architecture, and believe with us there are public objects to which our profession can minister, might well be justified in their own particular regret at the interruption of business which has so long deferred consideration in Parliament of the whole question of artistic copyright. It seems to be incident to the situation of this free country, that at frequent intervals, measures of any social importance shall be stopped, whilst some one question is adjusted between political parties; and the acquisition of a right of property in their works by architects, is amongst the class of nationally important objects, as we are prepared to show, which we have spoken of as held in abeyance.

It has been so much the habit of parliamentary orators and newspaper critics to depreciate architectural talent in our country, that we should hardly hope for attention to any detailed account of what has been lately effected by the profession itself. How much, however, has been done, and is in progress, our ordinary readers know. The proceedings of the now numerous societies; all the exhibitions of designs, and many buildings; with the recent report of the Institute; demonstrate that there will be shortly, few efforts omitted which can be initiated by the profession. Absolutely, whatever reason there may be to regret the condition from which we have emerged, the prevalence still of much that is bad in what should be architecture, or the lingering disputation about styles whilst there should be unanimity of aim and appreciation of all real art, there is no reason for our profession to think lightly of its claims, amidst demands greater and more varied, as we have ere this taken occasion to show, than were ever made upon it in any period of its history. What is needed further, chiefly is the aid of the public.

It is the public demand which makes the good or the bad in architecture; it is the peculiarity of the architect's branch of art that the public must express a demand: not only is the architect, like every other artist, the creature of his time and of its state of intelligence, but he must be subject to any caprice of the individuals at whose instance alone the profession can set to work. The architect can influence the character of the demand only by labouring *educationally* to improve those for whom he ministers. True, while he is thus using his energies for ultimate good, his own views are often warped or tinctured by the fallacies which he meets with, and the inevitable yearnings of his apparently immediate self-interest.

All that has been said above, is now perfectly familiar to the profession, and requires only to be diffused as information when a somewhat unreasonable public complain that they have not got the matured plant which they themselves have weakened at every period of its growth.

There is, however, another view of the subject of the interests which are common between our profession and the public. It is not recollected, how essential, in the progress of art, is the question of the rights of the architect, of property in his invention. The Institute at length moved in the matter; and claimed, a year ago, by petition to the House of Lords, the right which had been conceded in principle to literary productions, and manufactured articles of utility, and which it was sought by the Artistic Copyright Committee, working in conjunction with the Society of Arts, to have confirmed or established for paintings, sculpture, and engraving. More recently, as stated in the Report of the Institute, a committee was appointed to watch over the interests of architecture in the committee obtained in the Lords, just at the close of the last Parliament. Any results from Lord Lyndhurst's labours have yet to be made public; but we cannot doubt that his lordship will pay greater regard to the claims of architects than appears to have been paid by those professors of the sister branches of art who have made themselves heard loudest in the matter of copyright. The title which is the proper subject for protection, is that to *design*; and it is impossible for us to understand that there can be clear views in this respect amongst persons who would attach less importance to work of architecture than to that of painting.

Lord Lyndhurst was reported to have said, when moving for the committee, that the case had been mentioned to him of "eight or ten persons who had sent in designs competing for the construction of a certain very important work." He proceeded:—"None of them were employed to execute it; but when it was completed, it was found to be made up of parts taken from all these competing designs." But the deprivation of just rights to the profession is greater than is involved in a case like this, or one where a competitor receives only a "premium" not sufficient to compensate him for appropriation of work of his brain. The architect is defrauded habitually through the want of recognition of his rights by the law, and through the deficiency which results amongst builders and the public of the sense of what is due to property—or the fact that what happens to be criminal and punishable in one case, is larcenous by any code of morals in the other. Lord Lyndhurst said, referring chiefly to painting,—"In practice the effect of the present state of the law is, that a very extensive circulation of spurious copies issues, which is most injurious to artists of different descriptions, and which operates injuriously in many ways. The artist has lost the copyright in his works, and has been injured in reputation in consequence of their being copied by inferior artists. The public has been injured by the frauds committed. The extent of those frauds is most surprising." This, equally, is true of buildings and architects' work. The architect is employed to design, say an ordinary suburban residence—a work which cannot be remunerative to him on the established system of professional charges. It could be remunerative only on the supposition that the same design and drawings, with variations which he would readily introduce, could be turned to account in other houses to be built for the same description of demand. He will see, however, houses built to the very pattern, sometimes by the builder who had worked from his drawings: he will see his enrichments multiplied, and in unsuitable positions; and every time a degree worse in execution. At length he may be disgusted with his own work; and instead of having had the opportunity to effect those progressive improvements, through which would be realized the most satisfactory advance in architecture, he will become prone to extravagance, or variety without beauty, anxious less to improve upon what he has done, than to keep beyond his imitators. The new labour of design will have been saved to some one; or will have been charged for by the builder, without any return to the architect. In literature, such practice would in very short time stay the production of books, and bring to an end all that is good and noble in results from the labour of the pen guided by the intellect. It was the apprehension of such results more especially as regards England and America, which induced the demand for international copyright by authors of the respective countries. The rights of architects, and the interest of the public in the maintenance, form a case which is strictly analogous.

It is marvellous that it should ever have been contended that there was any pretext of justice or of interest, for the denial to inventors of the exclusive return to them of gains from their inventions for some reasonable period during which it might be probable the invention would have preceded others. The principle in the grant of patents, and the registration of designs for articles of utility, has always seemed to us correct; and the arguments for what the author of a pamphlet once called "the Policy of Piracy," and what appeared to be defended by one of the prominent men in the Upper House when the law was amended, were directed against what is a bargain advantageous to all parties, as well as favourable to progress. There is no such arrangement possible in the present state of the law between architects and the public: there is therefore no inducement to promote, by means of the exercise of professional qualifications, infusion of art into a class of building-work through which, by reason of its quantity, the greatest proportion of an architectural result at any time, from the mass of buildings in any populous district, will be manifested. Architects do not care to undertake work where the disproportion is so great as it is in ordinary houses, between the amount of contrivance required and the amount of remuneration. The destinies of our art therefore have got virtually into the hands of speculators, whose interest it is that bad work should not be noticed, and who represent that the expense of an architect is needless, putting the cost of one at the same time into their own pockets. "*Populus vult decipi*," &c. Paterfamilias, far from deeming it at all wisdom to give an architect more than 5*l.* per cent. on the three or four hundred pounds outlay, may offer less; or rather, will in few cases give anything at all. Thus whilst architectural ability of a higher order, in our public buildings, and in localities like the city of London, and towns where circumstances are specially favourable, is each year progressingly displayed; the singular contrast is put forth of a general state of architecture of which we can scarcely say whether it has not a tendency to become worse.

The value of architectural ornament, in which for the present argument we are right in including mouldings and all other decorative features, is obviously according to the place in which the form is used, as much as to its beauty viewed by itself detached. Nay, what may be called the intrinsic beauty may be utterly destroyed by erroneous allocation. Also, matter of detail cannot be lengthened or shortened, pared down here, or increased in enrichment there, without absolutely altering the conditions, and destroying the character and the beauty which there was at first. These results it should be quite clear, without any experience or architectural knowledge, are such as must accrue from working in opposition to principles by which ends are obtained, of whatever kind, by men of genius, or practical men of business. The facilities of reproduction by manufacture are now so great, that the architect himself is liable, under pressure of time, to seize upon ready-made ornaments, to the hazard of his work—which, under the old system, would have been throughout designed, each part specially, by himself or those impressed with his spirit. How much more liable then is the uneducated man whose horizon is bounded by his own plasterer's shop, and remnants of paperhangings. The question will be not affected by our admitting that the ornaments produced by certain decorators and manufacturers are themselves excellent in taste. It is not the moulds themselves which are faulty, but the hands which, with a small stock of patterns, are ever trying at architecture, by connecting forms together which have no bond of proportion or other union; from

which the result inevitable is that worst of demerits in a building, the predominance of failure and pretence.

If that exhibition of improved architecture is to be made, which we have said a section of the public asserts is wanted, an assertion which we should be the last to controvert; the public must simply, in the first place, enlist the services of those who are qualified by position, acquirements, and taste. Call the men by any name: for convenience we call them architects. It is useless, however, for the public to cry for results so long as they deny the inducement.

We do not hesitate to say that this inducement, and eventually the corrective for the large amount of bad design in buildings, which is exhibited in suburban London, in fashionable watering-places, and in almost every town and populous district, would be supplied by a system of architectural copyright. It is not to the pains and penalties provided by an Act that we look mainly, but to the moral influence from the simple registration of a fact, previously not apparent to many otherwise good and honourable men, as to what is comprised under the head *property*, and the injury done by every appropriation of it. Mr. Roberton Blaine, the Reporter to the Committee of the Society of Arts, well remarked in January, 1858,—"All the legislation which has taken place on the subject of copyright in England has proceeded upon the just theory that an author or artist has a *property* in his work. Where, therefore, a copyright work is *literally* copied, or copied with merely colourable alterations, it seems difficult to distinguish the moral guilt of such a theft from that of picking a pocket, and, consequently, that such an act of piracy ought to be punishable as a *criminal* offence." This, applicable to architecture as to each other branch of the exercise of genius, is what every man with the sense of right and wrong must exactly agree with. An unfortunate omission, however, was made in the Report to the Society of Arts. The Report stated it to be the object to secure a copyright "for the author's life, and thirty years after, for such of the designs of an artist as he may himself have conceived, and as have been produced by his own hands, or by those of his assistants, and as he may himself have signed and marked, so as to claim copyright for;" and it explained that such designs would be "works of which the artist's own brain may be considered as the inventor or primary source, and would include all, however first embodied; and whether they profess to be portraits of men or things, or the products of imagination; and will apply especially to the works of painters and designers, sculptors and die-engravers, and architects." But then after all this, they put forth the "qualification,"—"As to architectural plans, models, &c.; only the use of the originals to be secured; but not to prevent new drawings, &c. being taken from executed buildings or works." This would not be a sufficient improvement upon the laws at present in force, which are protective of architects' designs engraved, or lithographed, and published under Hogarth's Act. The original drawings only would be copyright; and as many of the speculative builders even work entirely without drawings, there would be nothing to prevent that sort of imitation or perversion of an original design which we have spoken of as one of the chief sources of annoyance and of injury to the reputation of architects. The enactment proposed would be useful only in the case of a competition such as that mentioned by Lord Lyndhurst. We cannot think that the clear intellect of the noble and venerable lord who has taken up this subject, will recognize a distinction of criminality, or will have suggested to him no means of working a clause which would prevent that reproduction of a lately erected building, of which instances will present themselves to recollection of most professional men. One instance will be found mentioned in a letter in our present number. The petition of the President and Council of the Institute of Architects, after saying that architects were "liable to considerable injury in the piracy of their designs and inventions, and that other parties can, and do, copy and appropriate to themselves such original ideas, without any benefit or remuneration to the authors," and that, therefore, "it was desirable to afford protection to architects for the copyright of their works," said,—

"Such copyright should extend to their executed works, as well as to their publications; that the copyright of an architect in any work executed, or of a work proposed to be executed, should not pass to the employer, except under special agreement, but remain with the architect; and that the designs, or drawings and specifications, prepared for the purpose, shall still remain so far the property of the architect, that the execution of a building shall be considered equivalent to registration as a work of art and science; that no other person be justified in pirating or reproducing the same in such points as are peculiar to the author of the design, without the permission of the author."

Generally, the petition sought the assimilation of the position of architects to that of authors and inventors. Such identity of claim seems to have been admitted by the congress on literary and artistic copyright which met at Brussels in December last. Works of design, paintings, sculpture, architecture, and engraving, were to be placed on the same footing as regards copyright, as works of literature. Nothing else can satisfy the justice of the case, and give the architect the reward for his labour, or effect the improvement which is demanded in our architecture.

Great has been the delay since the subject was started at the Society of Arts, owing to the shortness of the session and the dissolution. We trust that the question will be at once advanced in the Lords. A movement is going on, independent of that of the Society of Arts, and the draft of a bill has been prepared. But, this draft, when we saw it, purposely was made to omit all mention of architecture; and otherwise, the wording did not show the due recognition of that which must be the whole object of protection, namely, not the vehicle, or the process in the painting or drawing, but the original invention or design,—in short, not the manipulation, but the art. It is impossible, we maintain, to have correct views on this point, and to exclude architecture.

We, architects, want a demonstration by the law, of the fact that there is a right to property in architectural invention, as in all works of mind. The question affects not only architects, but those who might be benefited by becoming their clients: and it affects vastly the future of architecture. Piracy actually tends to the destruction of the profession, in what should be its widest field. Let the corrective be applied to the moral sense of the public (builders inclusive); architects will find it then their interest to attend to the smaller class of houses; many persons will be surprised that good planning and tasteful design may be had at very slight cost; and architecture may be advanced with benefit to all parties, and with the improvement which is needed in the aspect of our streets and our places of abode.

ON THE CONSTRUCTION OF DOMES.*

HAVING some few years since to erect a dome of very considerable span, I was surprised to find how little practical information existed on the subject. Being thence led to investigate and to make notes relative to domical structures generally, I have now put them together, in the hope that others may also be induced to give the result of their experience and studies respecting this beautiful class of buildings—the most beautiful termination, it appears to me, for any grand architectural composition.

In the present paper it would not be convenient to enter into elaborate mathematical investigations. I shall, therefore, merely refer to the principal theories on the subject; describe the construction and the cause of failure of some few of the most celebrated domes; and then try to sketch out some broad principle for adoption.

The theories best known are those of Dr. Robison, of Venturoli, and of Rondelet.

Dr. Robison's was, I think, first published in his "Mechanical Philosophy," and then re-written by him under the article "Arch," for the "Encyclopædia Britannica:" it has been referred to in almost every subsequent work on mechanics.

From this theory, the particulars of which may be found in the works to which I have alluded, are deduced directly the following somewhat startling results,—that a dome starting from a perpendicular drum could not stand at all; and, that a reversed curve is a much stronger form than the usual insistant one.

Venturoli's theory is given by him in his "Treatise on Mechanics," a very good translation of which has been made by Mr. Cresswell. The results are very much the same as Dr. Robison's.

Rondelet's theory is given in detail in his well-known work on "Construction;" and it has been very well condensed in Gwilt's admirable "Encyclopædia." It is of a much more practical nature than the others, and assumes that the weight of the upper part, pressing outwards, is counteracted by that of the lower part; the difference of the two forces giving, so to speak, the measure of weakness in the dome.

There is another theory to be found in the well-known "Parentalia," but to which I should not here allude, were it not almost the only one mentioned in that work; and although it may now appear almost absurd, the author's extended notice of it would induce us to believe that it must have been favourably accepted in his time. It will be found given at considerable length in any edition of the "Parentalia." It refers, however, more particularly, to arch construction.

Now, I have too great a reverence for the study of mathematics, and I am too sensible of the advantage that our profession derives from that science, to say one word that might appear to slight it; and, indeed, the great names I have mentioned would prevent my speaking so strongly as I am obliged to think of their theories, had I not found words as strong used by one of the most noted of the authors themselves, Dr. Robison.

In one of the articles to which I have referred, he gives an analysis and description of the arch. He puts the theory before his readers in a perfect manner; shows how beautifully the exact size of every stone, and the curve of each arch can be calculated; and, in fact, leaves us quite satisfied that the theory is correct. Then, having made everything so clear, he quietly informs his readers in an equally clear manner, that the speculations of all the eminent persons who have written upon it are of no practical value whatever.

The fact is, that the most celebrated of these theories assume as a basis that the arch or dome is formed of layers of stone, sliding freely upon each other, without bond, friction, or the interposition of cement—conditions which never have occurred, and which never can occur in actual practice. Moreover, it is really, for all practical purposes, almost waste of time to deduce calculations for constructing stone domes at all; for, curious as it may seem, I believe that there is not existing, and that there never has been built, any stone dome of very large size, since the time of the Atridæ at Mycenæ.

The construction we have to consider, if it is to be of any practical use, is of brick, and this material is so combined, in execution, with cement, that the theoretical joints do not really exist; for, with good cement, the bricks themselves are as likely to yield as any of the joints. In stone construction the case is different. The thinness of the mortar in the joints makes them really what their name implies, and we should consequently approach near to, though we can never actually realize, the conditions of the theory.

Now, in addition to the difference in the materials, we must also remember that the details of construction in the domes now existing vary very much, and that they are by no means to be resolved by one theory. As I propose to notice actual examples only in this slight sketch, I must ask you to examine with me, briefly, the principles of construction of the most noted. The first to which I will allude is the celebrated tomb of the Atridæ at Mycenæ.

I need scarcely mention that it is formed of horizontal layers of stone, in large blocks worked to the form of the curve on the inside only, and without, so far as I am aware, any cement in the joints. It is of considerable size (48 feet 6 inches in diameter), being about that of St. Vitale, at Ravenna, and somewhat larger than that of St. Stephen's, Walbrook. The construction displays great simplicity, and, theoretically, no power, short of what would actually crush the very stones, could, so far as I can see, break this dome. The pressure at every joint is perpendicular, so that there is really no outward thrust, and the tendency of each stone to fall inwards is met and destroyed by the opposite thrust of the other stones. If the task were now given to erect a dome of a pointed vertical section, with large

* Read by Mr. T. Hayter Lewis, hon. sec. at the Royal Institute of British Architects, May 16th. For report of discussion that followed, see page 347, *ante*.

masses of stone, such as the architects used of old, I doubt if a better mode of accomplishing it could be found.

The next examples are those of the well known Pantheon (142 feet diameter), and of the Temple of Minerva Medica (81 feet diameter);—baths or temples, as you will.

These domes are formed of several ribs of brick, which appear to have been built quite distinct from the filling in work between them; just as in early Gothic vaulting the various ribs were first formed and set in their place, and then the intermediate light chalk panels added to complete the whole.

This opinion as to its construction is confirmed to a certain extent by the way in which we know, to our regret, that the dome of the so-called Minerva Medica has perished. But a few years ago the ribs stood firmly, although a great part of the filling in between them had disappeared.

I believe the same might occur at the Pantheon, and that its skeleton construction is just that of York Chapter-house; so that, without at all altering the leading principles, we might arch the filling in to steady the ribs, and convert the great dome of the Pantheon into a gigantic resemblance to its graceful little English rival. Whether or not the change would be approved, it is not for me to surmise; but that the vast building would at once display, as it never has displayed, its enormous size, I have no doubt whatever. Setting, however, this question aside, it seems to me that, in this greatest and noblest of domes, we have the essentially Gothic principle of security by abutment, and not by a tie; for if, as I believe, the stress be borne by the great ribs, the tie, to be effectual, must clearly be straight from one of them to the other; otherwise, if we put it in the circular form, the feet of the ribs would spread outwards, until the tie became straightened. But if we fill up the space between the ribs, this filling in would serve to strut them; and preventing, by its circular form, the tie from straightening, may occasion it to act. If, therefore, in the Pantheon dome, there be any real binding courses, I believe that they act as ties to the ribs only by the filling-in acting as strutting. But I do not believe that the tie exists at all, but that the stability of the dome is secured by the strong abutment only.

The next example is the dome of St. Sophia, at Constantinople, of about 110 feet diameter. Of this we have ample information, beginning with the history of the building, so beautifully condensed by Gibbon, down to the recent elaborate drawings and description of Salzenberg. Unfortunately the ancient accounts, so clear and precise, are erroneous in one important particular; for while all state that the dome was finally reconstructed as it stands, of pumice stone, or light Rhodian bricks, Salzenberg informs us that no trace of these can be found, and that it is formed altogether of ordinary well-burnt bricks. It appears that the four great piers at the angles of the square on the plan were the only supports at first adopted, and that the pendentives and dome were formed on them. The pressure of the eastern and western arches springing from the great pier was resisted by four walls, forming transepts running north and south. Against the eastern and western walls respectively abutted two semi-domes. The superstructure having given way towards the east, taking away the semi-dome on that side, the eastern pillars were strengthened, and the dome was again turned; but it again gave way before it was completed. Strong buttresses were then built to the east, and a dome (this time of pumice stone) turned for the third time. But it became cracked and split, the arches under being so fractured that those on the north and south sides required to be filled in with the three-storied arcades now forming such prominent features in the interior. This dome then stood awhile; but it was destroyed by an earthquake, and was subsequently rebuilt.

All this narrative would show that the substructure was the defective part, the great arches not having sufficient abutment; and that, whether the dome as first built would have stood or not, not one, however sound in itself, would have stood upon such a base. Whether constructed of pumice stone or of light or heavy bricks, the recent dome seems to be of homogeneous construction, without separate ribs; answering, in fact, to our ordinary idea of a dome, as typified by the *internal* brick dome of our own St. Paul's. The general thickness varies from about 2 feet to 2 feet 6 inches. It has strong buttresses as abutments (8 feet 6 inches thick) above the springing, and the walls under are excessively thick, as compared with the thickness of the vaulting.

The next example is the dome at Beejapore. It is formed of a solid mass of brickwork, put together with good mortar. It is 124 feet diameter, and varies in thickness from 10 feet 6 inches at a little above the springing, to 10 feet near the top: so that it is four times as thick as that of S. Sophia, with a diameter one-eighth larger. I have few data from which to form an idea of the strength of the material, but I assume the general construction to be on the same principle as that of S. Sophia, but differing from it in weight, thickness, and bearings.

The dome of the cathedral of Florence is 138 feet 6 inches in diameter, octagonal in plan, with a great rib at each angle, and two smaller ones on each face. These are connected together by a thin casing, about 2 feet thick outside, and a thicker one (averaging about 7 feet) inside, with tiers of arches turned between the ribs, in order to strengthen these casings. At the foot of the dome is a strong tie, composed partly of timber and partly of iron; and the whole mass rises clear above all the surrounding parts of the edifice, showing that the dome is quite self-supporting, and that it derives no strength from external abutments of any sort. It supports a heavy ornamental lantern; being the first great example in which this weight, extraneous to that of the dome itself, has to be supported.

Some settlements appeared soon after its erection, but the whole seems to have stood without any serious defect until the end of the seventeenth century, when several fractures appeared for the first time, or were then considerably increased. They are said to have extended through the whole thickness of the dome, to have descended also, through the tambour, to the main arches, and thence, in a clearly traced line, down to the ground. It was, therefore, the opinion of some, that the foundations only were in fault; whilst others considered that the dome had opened from lateral extension, thereby bursting upon the tambour, &c.; and that it should be encircled by iron ties, to prevent further spread. Fontana was of this opinion, and his advice being adopted, three iron ties were prepared. However, before they were completed, the contrary opinion, advocated chiefly by Nelli, prevailed: the ties were not fixed, and the fractures were merely secured by dovetailed cramps. The present stability of the dome proves that this remedy was effectual.

The dome of St. Peter's, the design of Michelangelo, though carried out by Fontana, is about 139 feet in diameter, and differs from that of Brunelleschi just described, by being circular instead of octagonal on plan; but like it, is formed of sixteen ribs, united together by a double casing, the outer about 2 feet 10 inches thick in the centre, and the inner 6 feet thick. It stands on a tambour without abutment at the springing; but a little below it is encircled by a peristyle, not, however, of mass enough to act in any great degree as a buttress to counteract the spread of the dome; and at the top of all is a heavy lantern. The dome is built of brickwork. Four ties were first inserted, at different heights. These proved ineffectual, the dome becoming very much fractured; and in 1743 two others were added, encircling the tambour and peristyle below the springing. The next year three others were added round the exterior of the dome; one near the top, a second half-way down, and the third at the foot. In 1748 another tie was put round it, at some distance above the springing; and this is, I believe, the last addition, the dome having appeared to be secure since that time. If my theory of dome construction be correct, this tie is the *only one* required.

I come now to the important question of the double wall or casing of this and of the Florentine dome. I scarcely know the general idea respecting this system of dome construction; but, so far as I have been enabled to ascertain, it seems to be considered a method of obtaining strength by a clever arrangement of the material, much in the same way as we obtain it by casting a given amount of metal into a large hollow column instead of a small solid one.

Now, let us try how these domes could be broken, and we shall then get some clue towards calculating their strength.

Taking any one part separately, it might be bent or broken horizontally, as a bow might be; or it might be similarly broken in its perpendicular section by the weight of the lantern pressing on the top, whilst the bottom was secured by an abutment or tie. This weight would act upon and be resisted by the perpendicular section, in the same manner as in the large boxed iron cranes now used in the docks, &c. For, if we may apply to these magnificent domes so homely an illustration, we may consider each pair of two ribs composing them, with the casings between, as huge bent tubular girders, of almost the same outline as those forming the dock cranes.

Now, any force that we can conceive likely to act as destructive to the dome would produce a strain on the outer flange or casing tending to tear it asunder, whilst it would endeavour to compress or crush the inner one: we should, therefore, expect to find (supposing that the great architects who designed these domes adopted the hollow walling for strength) that they had arranged them as we should arrange the metal in a girder, distributing it in different amounts, in proportion to the forces that they have to resist. It is clear, however, that this was not the idea of Brunelleschi, or of Michelangelo; for the external casing of their domes has no provision for resisting extension, whilst the materials of the internal vaults appear from their thickness to be intended to resist direct compression only.

I know of no other way in which the double vault could be intended to be used so as to give strength. It could not be with the notion of obtaining it as we do in a square hollow column, because a direct strain, perpendicular throughout to the direction of its length (an element necessary to the stability of a column), could not be brought upon it. It would, in fact, give way in the curve, as a bow would when pressed at the ends.

Brunelleschi's own description, as recorded by Vasari, seems to give us clearly his idea of the whole, and to show that his plan was to obtain the necessary strength by the ribs, and not at all by the double vaulting. He states that the external vault is necessary in order to protect the inner one from the weather, and he directs that the latter, after it had been raised to a certain height, should be formed of the lightest materials that could be found, whilst the ribs were to be built up throughout with solid stone.

I apprehend, therefore, looking at the whole question, that Brunelleschi's idea was to construct the ribs of a certain form and thickness, and then to fill in between these ribs, so as to stiffen them and complete the vault inside and out, leaving a hollow space between, in order to lessen the weight as much as possible. The inside casing, both at Florence and at Rome, is made the thickest, as it has to bear, to some extent, the strain of the ties.

We have in England a beautiful example of the way in which stone ribs will stand when the rest of the vaulting has fallen, in the picturesque ruins of Mayfield, one of the most interesting remains in our southern counties. The whole of the ceiling, whatever it may have been, has disappeared, but the ribs still span the width of the great hall strongly and boldly; and with a few cross arches to steady them, and take the strain of the ties, I believe that the grand stone ribs of Brunelleschi's skeleton would do the same.

The last example I shall quote is the dome of our own St. Paul's; the first, I believe, of its type, but the general system of construction of which has been followed ever since. I do not wonder at its being thus copied; for the majestic effect gained in it by its architect has never been surpassed, and the whole composition of the exterior, at least, is to me the most glorious specimen of Italian architecture.

There is no direct abutment to sustain the thrust of its cone, which, contained by its tie, and held together by the general goodness of the work, stands firmly upon the tambour, without exerting any expansive force. I believe that in this cone we have the true secret of domical construction, which shows itself here in the simplest form, unconcealed by the curved outlines which in other cases mask whilst they adorn the reality. Secure this cone at the foot, and I know of no power that would break it, short of what would crush its materials to powder. Bend the straightness of its sides into a curve, so as to enlarge it to the form of a dome, and as the curvature is increased the strength is lessened. Where would this curved dome break? Clearly, if it were weighted at the top, and the foot kept from spreading, it would break, like a bow, between the two points. Tie in this weak part, and the danger at that part disappears, being transferred to two other points between them.

In this view it will be seen that I look upon the fabric as being necessarily secured by a system of ties, and that it is not to be safely trusted to the independent strength of its own construction.

Assuming, however, this latter notion to be correct (as undoubtedly it is in theory), and that each particular ring of the dome is, by the goodness of the bond and the strength of the materials, strong enough to resist the pressure tending to

burst it outwards, we might suppose that it would be self-dependent, and safe, without any extraneous guard of iron or other tie. But I apprehend that in practice, this construction would be decidedly unsafe. Doubtless a vault of good brickwork laid in cement would be strong enough to resist any strain that the weight of a dome above could bring upon it, for we know its strength to be such that it is uncertain whether the bricks or the joints would break first, but in practice it is not safe to trust to this extent; strong as the work may be, the slightest yielding in the foundations will cause an unequal bearing in the weight above, and in a moment rend the strongest work. We may, indeed, imagine that a dome on a small scale may be formed of materials so strong and yet so light as to be, effectively, of one piece only, as though cut out of a solid block of stone, as is the tomb of Theodoric at Ravenna, or formed in one piece like a reversed cup; and in such a structure, no doubt, from the extreme tenuity yet strength of its substance, no ordinary rules for estimating the strength will apply.

Such also may be, and probably is the case with such small semi-domes, for instance, as have been put up by my friend Mr. Scoles. One of them has a diameter of 30 feet, and is formed of four courses of plain tiles in cement, altogether 4½ inches thick. I believe that no failure has occurred in this kind of construction, which I have, in my own practice also, found to succeed very well. The strength, in fact, of this kind of work is so great, while its weight is so little, that it would perhaps render the fabric independent, to some extent, of a failure in the foundation, and unless it were heavily loaded in some particular part, would require scarcely any abutment or tie. Certainly, this may and does suffice for small works; but if we extend the size, we shall find the plan a somewhat dangerous one. We may strengthen the vault — put 2 feet of thickness where theory tells that one will suffice—and so trust our theoretically self-tied unbuttressed dome to stand as the great ones of old have stood. But in adding to its strength we shall have doubled its weight; and should the carefully secured foundations yield only a hair's breadth to this weight; should a little spring but carry away, gradually and unnoted, grain upon grain of the sand on which the massy piers of the dome may rest, soon will come the inevitable settlement, and our massive dome will rend and break away as though an earthquake had rocked it, and the more certainly in proportion to its very massiveness.

Send but a single fracture through the thickness of the vault, and its self-tied structure is resolved into two or more separate parts; therefore, although I do not doubt that a dome may be made so strong and well compacted as to need no extraneous tie, yet the risk of fracture is so great that we ought not to depend upon the safety of such construction only, but insure for it such an abutment as may resist thrust, or such a tie as shall be free to some extent from the risk of fracture from the pressure of the mass above, in case a settlement should cause the latter to press unequally.

One instance, indeed, the well-known one of St. Vitale, at Ravenna, exists, in which the construction is so arranged as apparently to provide against the necessity of any extraneous aid.

The dome is formed of a triple coil of earthen jars, the end of each being socketed into the top of the one adjoining in a very ingenious way, so that it seems to me that if a settlement were to occur in the substructure, this peculiar arrangement would allow of a slight re-adjustment of the coils without destroying their connection. The only guard against the outward thrust is, so far as I am aware, the weight of the walls above the springing; and, altogether, this dome appears a very fine piece of construction, and worthy of a close and detailed investigation. In fact, I know of no other existing which combines all the qualities of strength, lightness, and flexibility, without the aid of any extraneous tie; but it has not to bear the great weight of the lantern which presses so heavily on the Florentine, Roman, and London domes; and I should hesitate to speak too confidently of its capacity to bear it, even if its outline were raised to that of a pointed arch.

Passing, then, this example by as one of doubtful authority, and looking only on the form of dome construction most usually adopted, and supposing its work to be good and solid, there will be little principle of the arch involved in its construction, whilst it might in fact be built up in a solid mass like the arched rib made by the elder Brunel some years back, by building it out from each side of a pier so as to maintain the equilibrium of the two half arches.

We know that he proceeded with the construction till each semi-arch overhung 60 feet, and if the corresponding half had been carried out, the two together would apparently have formed one arch of 120 feet span; in the same way that two raking pieces of timber would form an arch by abutting against each other.

Now, how should we break one of these carved ribs, assuming it to be secured at the bottom and loaded at the top with the heavy weight of the lantern?

I apprehend that it would snap at the lower part of the bend, and at that point, therefore, we should want the tie: if secured there, any weakness would be felt at an intermediate part of the curve. But supposing that, instead of a curved beam we had an angular one, and that it was carefully secured at the angle, it is obvious that we should have the form of the Mansard roof alluded to by Dr. Robison; and I know of no power that could break it, short of actually crushing it. Now we have this condition actually fulfilled in the cone of St. Paul's, which, so long as the tie exists, may be considered indestructible: let us, therefore, take this as a starting point, and going one step further, suppose that Wren wished to make, as Brunelleschi did, the shell of the fabric form its outline, inside and out, instead of concealing it, as in St. Paul's.

Add any form of curve we like, the cone itself would still remain as the great constructive skeleton, to which any super-added mass would serve only as a clothing. I believe that this is the real secret of constructing domes whose size exceeds the safe limits of a brick or other beam, and that we ought to make such domes approach so closely to the conical form that their section should include that powerful outline within their thickness.

I do not say that a great dome cannot be safely erected with other outlines, because by careful attention to the goodness of the materials, and to the general bind of the work, it may, no doubt, be made secure. But I believe the form above mentioned to be the safest, and that any departure from it entails risk. To test the correctness of this opinion as far as possible, I have applied the form to the sections of the domes of the Pantheon, of St. Peter's, and of the cathedral at Florence, with the following results:—In the Pantheon, a cone of 2 feet thick (about 6 inches thicker than that of our St. Paul's), is contained in the curved surface from the horizontal line at top to the abutment. In the Florentine example a cone of much greater thickness is contained within the curved section from the foot of the lantern to the tie originally inserted by Brunelleschi, and never added to since. In St. Peter's, a cone of similar thickness is contained in the curved section from the bottom of the lantern to the tie last put in, since which time no other has been, I believe, required.

The rule bears, of course, upon one particular class of domes, in which a top mass of great weight has to be borne, independently of the fabric itself.

There are, however, other cases in which this conical form does not obtain; but in these, so far as I am aware, the weight of the lantern is wanting, so that the curve has only the weight of its own section to sustain. Such are the domes of S. Sophia at Constantinople, and the celebrated one at Beejapoor. Having no personal knowledge of the Indian domes, I speak of this last example with much diffidence, but judging from Mr. Fergusson's excellent description, I should say that the enormous thickness of this well-compacted roof renders it, as it were, equivalent to being cut out of one solid stone.

I am the more satisfied that this is a correct idea respecting these domes, because it is stated that in some of them, though the foundations have given way, the domes are left intact.

I shall, however, assume it to be composed of somewhat inferior materials, so as to render the outline of consequence, to ensure stability.

In these flat-topped domes we have to provide both against the weight of the mass, and the extra weight after every snow-storm; and although this is not likely to demand the precaution of the single cone, still the conic principle modified must, I think, be carried out; and we must provide against the strains as we should in a Mansard roof, by inserting a tie at the base of each cone (answering to the roof strut) varying in strength in proportion to the angle and the weight. But it is clear that there is a limit to the angle, beyond which it would not be practically safe to trust to the cone, and for reasons too long to mention, I think that 40 degrees with the horizon should be the limit.

Beyond this upper cone there remains an almost horizontal flat portion (seen most clearly in the example at Beejapore) of such evident weakness, that Brunelleschi was of opinion that it could not be strengthened sufficiently to bear the weight of a lantern, and for this reason he gave his dome the section of a pointed arch. It is undoubtedly weak, and cannot be treated in the same way as the lower parts.

Let us suppose a solid ring at the top of the cone, leaving an opening as at the Pantheon. So far it will be safe. We have now to fill in this space with brick or stone work capable of bearing the superincumbent weight; and this filling in must, I think, be considered as a solid curved beam, cut out of a mass, and strutted well at the abutments, conditions requiring no great strength where there is no lantern.

In conclusion, I would briefly recapitulate my opinions respecting the construction of domes.

I consider that the essential element of strength in a dome is a straight cone (whether simple in one unbroken length, or compound in two or more lengths) comprised within the section of its vaulted covering. That the base of each cone must be securely tied. That although, for the same reason as in ordinary walling, we ought to secure by bonding and perfect bedding this vaulted covering in every part, yet, with good materials and work, these ties at the base of the cone are the only ones theoretically required. That the strength of such ties at any part is to be found by resolving the weight, by the ordinary resolution of forces, into the lateral pressure at that part. That in domes with heavy weights at the apex the straight cone is the only safe one to adopt. That the vault may be made strong enough by ribs alone, and that when these ribs are required not to project beyond the general face line, inside or outside, double vaulting, as at Florence and at St. Peter's, may be safely used, but only as a means of lightening the weight. That although, by the goodness of the work, domes may be erected strong enough to bear any amount of weight without any extraneous tie, yet that such tie should be always inserted as though the ribs were quite separate, in order to guard against settlements. Lastly, that the thickness of dome will be sufficient if it include within its sections a cone, necessary to bear the weight.

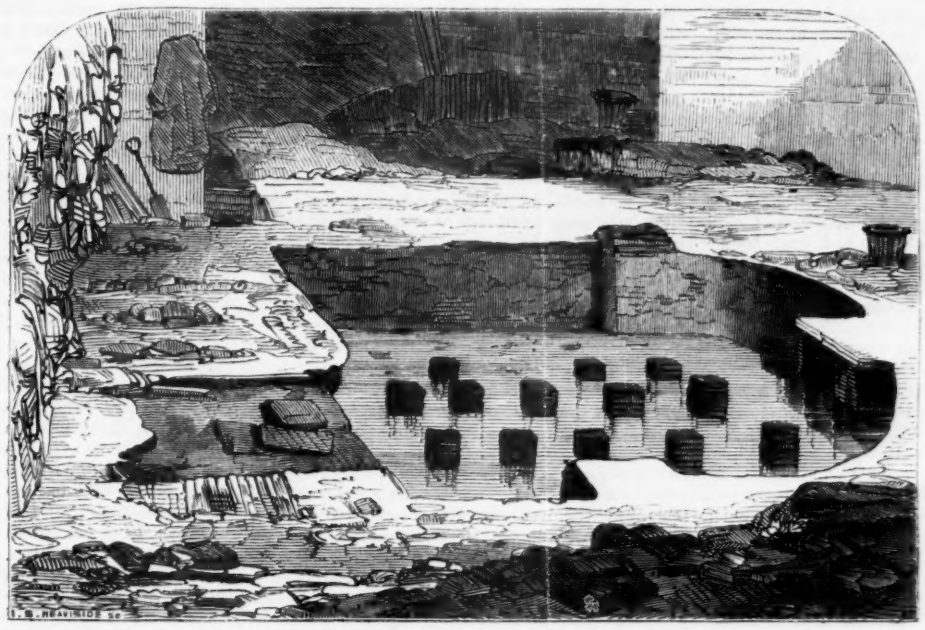
Though believing these views to be correct, it is with considerable diffidence that I put them forward, as they are, I have reason to think, opposed to those entertained by some who are well qualified to form a judgment on the subject, which is, indeed, one not to be entered on lightly. No one can forget the sense of solemn awe with which he has viewed the gigantic vaults of which I have spoken: for my own part, when engaged in investigating the secret of their build, in laying bare as it were the skeletous of these great works, and touching at every turn the memorials of such men as Brunelleschi, Michaelangelo, and Wren, there arises with the ordinary methodical calculations respecting strength and materials a strange feeling of reverence for the works we have been examining, and of distrust of my own ability properly to comprehend them.

ARSENIC IN PAPERHANGINGS.

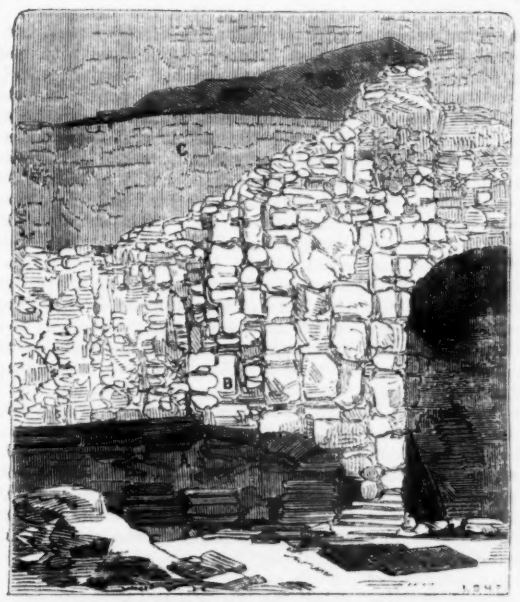
ANOTHER case of illness is recorded by a medical man, in connection with the use of *green paperhangings*. Mr. Medlock, of Great Marlborough-street, says, "I have analyzed three specimens of the paper, and also some of the *dust* swept from the carpet. In each of the papers I found a great quantity of arsenic, and in the dust a very large proportion of that fearful poison. I would, therefore, earnestly recommend the public to avoid purchasing green paperhangings; and, in cases where rooms are already covered with such papers, to have the walls well sized and varnished, in order to prevent the atmosphere becoming poisoned by the arsenical dust." Surely the manufacturers of paperhangings will now arrange to prevent the evil alluded to. Its existence cannot longer be denied. If they will not of themselves discontinue the use of deadly poison, the power of the law must be tried.

HOUSES IN ISLINGTON. — A correspondent, "J. S." says that for a seven-roomed house in Murray-street, New North-road, rent 32*l*. "in twenty-four hours no less than forty applicants rushed for it," and maintains that "1,000 houses are wanted there, and would let before finished." It seems to us there is no lack of builders in this quarter; but it is quite true that houses let as soon as ready. Whether or not they sell as readily we cannot say.

ROMAN REMAINS, IN LOWER THAMES-STREET, LONDON.



Hypocaust.



Ancient Wall, East Side of Coal Exchange.

Fragments taken from the Hypocaust.

ROMAN LONDON.

REMAINS ON EAST SIDE OF COAL EXCHANGE, LOWER THAMES-STREET.

IT will be remembered that when the ground was excavated for the Coal Exchange in Lower Thames-street, a hypocaust, well, and other remnants of Roman construction were discovered. Mr. Bunning, the excellent City architect, took pains to preserve them, and they are visible to such visitors to the Exchange as may ask for them. Few people, it seems, do ask to see them, and those who expended money, and made their arrangements in order to preserve these remains, are perhaps disappointed that it is so. They may rely upon it, however, that they have the thanks of many whose thanks are worth having, and that the money expended was most wisely laid out. What we have now to say, however, is, that in excavating for a house on the east side of the Coal Exchange, an additional portion of the Roman building, including part of a hypocaust, has been thrown open. It was found at a depth of about 11 feet from the present surface. The hypocaust is nearly square, with a semicircle added towards the east: the covering has been broken down, and exposes the piers formed of square tiles as in other cases: some of these are also broken down. In clearing this from the rubbish which has for ages collected, bones of various descriptions, Roman tiles and portions of flues, fragments of pottery and glass, portions of tesseræ about an inch square, and pieces of vessels of a mediæval date, were discovered.

To the west of the hypocaust, against the Coal Exchange, is an ancient wall, built upon a foundation of Roman materials: in one part, which is marked B in the engraving, the work is formed of stones of large size: this may have been a portion of the old wall of the Thames.

It will be noticed that the depth at which these Roman remains have been found is not nearly so great as that at which antiquities of a similar date were found in Cannon-street.

We are told, by a person who had carefully inquired into these things, that, in the streets leading towards Blackfriars, pavements of large boulder-stones have been found, at the depth of between 11 and 12 feet from the present surface. These boulder pavements are not unlike the Roman road still to be seen in the Forest of Dean, Gloucestershire.

REFERENCES.

A. Foundation of Roman tiles and Roman *débris*.

B. Ancient wall of large stones.

C. Back of the chamber in Coal Exchange, in which the hypocaust, formerly discovered, is preserved.

AN ASYLUM FOR DRUNKARDS.—An asylum is being built at Binghampton, U.S. for that class of lunatics usually called drunkards, who cannot restrain their passion for alcohol. The building is 350 feet long, 65 feet wide, and four stories high. Since the work was begun 2,800 applications for admission are said to have been received.

WHAT SHOULD MECHANICAL WORKMEN BE TAUGHT?

ON Saturday evening last, Mr. Scott Russell delivered a lecture at the Brompton Museum on the description of instruction which should be communicated to mechanical workmen.

The theatre of the building was crowded in every part.

The lecturer commenced by observing that he had the honour of appearing before them in a somewhat unusual capacity, in consequence of a conversation which had taken place not long ago between one of that great establishment and himself on the subject of the education of the class of workmen to whom he (Mr. Russell) belonged. Mr. Cole had shown him some papers which he had prepared for the purpose of examining workmen as to the progress which they had made in the kind of education generally provided for them; and expressed to him what he (Mr. Russell) now expressed, that the education provided in this country for workmen was not that which was very directly calculated to render them good workmen. He did not mean to infer that education did not make us all the better and wiser,—at all events, it put in our hands the means of acquiring knowledge, and therefore reading, writing, drawing, and accounting were good for the skilled workmen, and for everybody else. It did not, however, consort with his experience, that the best reader and the best writer were always the most skilled workmen: on the contrary, the best man he ever knew could neither

read, write, nor account, and yet he was a very admirable workman. As a large employer of skilled labour, he now asked whether there was any description of education which in their opinion would tend greatly to the increase of the skill, dexterity, ability, and success of the practical working mechanic. He maintained that there was, but that the mechanic did not get it. It was extremely difficult to give, but if the rising teachers of the next generation—if the institution in which they were then met—if the Government—really and earnestly cared about the mechanic, and wished to make him a good and skilled workman, and wished to keep the next generation of workmen where English workmen had ever been—namely, at the head of the workmen of Europe—he would show what it was their duty to do, and what ought to be done. It was, no doubt, difficult to accomplish; but, if they all pulled together, it could be done. It would want a good deal of money, large and wise views, and great energy and self-denial. Having said thus much of the difficulties of the undertaking, he would recommend them not to be disheartened, as, if a little seed were sown, a little agitation commenced, and a little ventilation given to the matter, the Government might be induced to do all that ought to be done. The matter, moreover, was a serious one, because the Governments of other countries were doing a great deal for the education of their practical mechanics, which we, as a nation, were not doing. He himself was obliged to get his very best draughtsmen and mechanics from foreign countries. He had men in his employment from Prussia, Germany, and Holland; and he was bound to say that, as far as preliminary education was concerned, although the workmen of foreign countries had not the skill obtained by the British workmen from practical experience, their scientific knowledge was greater, and that knowledge was telling so rapidly on the present generation of workmen, that we were now equalled (he would not say excelled) by the workmen of many countries upon whom we were inclined to look down a few years ago. He hoped they would clearly understand that he did not say anything against the education now given. On the contrary, he would say, "Continue to teach drawing, reading, writing, and accounting in the best manner you can; but if you have a class of young workmen coming forward to learn, think how you can turn the little time they can afford to give to the best advantage, so that you may raise them higher in the social scale, and make them better workmen." In order to do this, it would be necessary to give them a higher class of education than they were ever taught before. They had already been taught arithmetic, and they could answer such questions as, "How many yards of ribbon at 3½d. can be bought for 80s.? Now, this was all very right and proper for shopmen and shopwomen, but would not do for mechanics. They were also taught geometry. They were taught the 16th, 17th, 18th, and 19th propositions of Euclid, but that description of knowledge was not of the slightest use to his workmen, or to anybody else. They were also taught mechanics, and the law of the lever. That was right; but then, mechanics and the law of the lever were not ordinarily taught in books in such a way as to be of practical use to the British workman. We did not go far enough; but the pupil teachers whom he addressed were not to blame. The persons to blame were their teachers. Two years was perhaps all the time that could be devoted to education, and six months were often devoted to as many books of Euclid, which were wasted for all practical purposes, unless, indeed, the student intended to become a professor. He would advise them to skip over the beginning, and devote the least possible time to Euclid—in fact, he would advise them to do a very heterodox thing—to cut off all the propositions but the useful ones. They might naturally exclaim: "Then, how little will be left." Precious little, he admitted, but plain trigonometry would be left. Suppose, for instance, a man had but six months in which to learn. Six weeks might in that case be given to Euclid, and then trigonometry might be commenced, solid geometry might next follow, and that constituted the whole education of the workman. But that was precisely what he did *not* get in the present day. He would also teach within the six months conic sections, and afterwards the nature of curves, within the first, second, third, and fourth degrees. He was aware he might be met by the exclamation—"Oh! but we will be teaching them more than we ourselves understand:" but to this he would answer—"That is the fault of your education." Sir Isaac Newton discovered no less than 130 curves, and nine-tenths of them would be of great use to the mechanic, if he had them in two places—in his head and at his fingers'-ends. Having now got to teaching something which they did not know, and had not learned, the next thing they wanted was the assistance of the Government. Decent elementary text-books were wanted for the higher departments in mechanics, but there were many able men versed in the sciences, and what he wanted the Department of Science and Art and the Government to do was, to ask the four cleverest men in England to write, in the fewest possible English words, all that they knew (not all that they had read), or in fact so much of their brains as they carried about with them. If Government would but pay handsomely for these books, a set of treatises might be collected such as the world never saw before, and such as would be sufficient to teach any mechanic his business. They might, it was true, say, "But we do not know where to get these clever men." But he knew where they were to be got. There were three of the four present at that moment; and, if the Government would but give them a thousand pounds a-piece for writing the books, he was sure they would write them. What he had said about geometry was true as to mathematics. Thirteen yards and a-half at 3½d. was not what was wanted. Of far more importance to the working man was the comprehension of the laws and relations of numbers, so as to enable the working man to think in figures about the immediate business before him. Having explained the manner in which mechanics might make reduced or enlarged models, and the relations and practical properties of numbers, the lecturer illustrated the value of a knowledge on these points by an anecdote. He remembered an instance in which a respectable working man sent in a tender for 12,500*l.* for a very large piece of work. The tender appeared to be low, and he obtained the order, and had got on some way with the work when he found he had made a trifling omission—he forgot to multiply by *two*. His figures were all right, but in one place he forgot his multiplication, and his whole calculations were wrong. He was of opinion that geometry ought to be taught by a large and comprehensive system. Professor Airy had written the best and the clearest treatise the world ever saw upon weight or gravitation. It was published in the *Penny Cyclopædia*, and he recommended every working man to read it; for, although the subject might appear to be a dry one, he could assure them that it was most fascinating. Eilaw's Mathematical Treatise was also a succinct and admirable work, which would be found of the utmost practical utility to the working mechanic. The first and most important doctrine to remember in mathematics was, that shape is not size, and size is not shape. This might appear to be an axiom, and he thought it was as good as any in Euclid. The doctrine of similar triangles was a fundamental principle entitled to the dignity of an axiom: it was that, without regard to shape and size, any number of triangles might be made all of the same shape and not of the same size. Mr. Russell having illustrated this principle by drawings on the board, continued to say that, with respect to solid geometry, the two great duties in a workman's life were conversion of materials and adaptation to strength. A mason who used up a wrong stone, or a carpenter who selected a wrong plank, or piece of timber, showed that he was ignorant of one of the most useful portions of his art or calling. Now nothing would teach conversion of materials like solid geometry: it was in fact the daily business of the workman. It had been said that every block of marble cut from the quarry contained a beautiful statue, but the art was how to get it out of it. This was very true; for what workmen wanted to know was every shape, and how to get out another shape. The workman who took from a heap a block of stone, or a piece of timber that cost his master 50s. when a piece could be got, answering quite as well, which cost 25s., inflicted a loss upon his employer perhaps equal to a week's wages. Hence the necessity of acquiring a knowledge of solid geometry. But if there were beauty in the quantity of numbers, and in regular geometrical figures, there was infinitely more beauty in curves. It was the duty of many mechanics, especially of those engaged in ship building, to make curved lines. To him it had always been an interesting subject to learn how curves grew. He was aware he might be told that the higher curves were never taught, but his answer was that they might easily be taught, and that they were very easy of comprehension. In order to effect this, somebody, who understood the subject, would have to be prevailed upon, not to write a book, but to put down in the shortest and plainest possible language what he knew of curves. This would be a treatise which the workman could understand, and would be well worth the thousand pounds which he hoped the Government would be prevailed upon to give to one of the four clever men to write. The lecturer then explained, with the aid of the board, the various mathematical figures, known as conic sections, parabola, ellipse, hyperbola, and the movement of comets. These, he contended, might be learned so as to make the workman master of the principle within six months. The subject of the education of the workman was one which he had very much at heart. He did not know how it was to be given, but as the pupil teachers were present as an institution which took charge of the mechanic, and a Government which was anxious for the spread of education, he would urgently beg of them to take counsel with half a dozen of the best mathematicians of the day, and arrange with them to write short treatises, which could be circulated at a cheap rate, and which could be taught in our elementary schools. He also thought that there ought to be a large quantity of apparatus—a sort of inventory of education—of every conceivable shape and object. In addition to these models, he would have the school-room hung round, not with pictures of animals, but with solid bodies, which could be explained and drawn. He would, in fact, impart any kind of practical, rather than theoretical, knowledge. If drawings merely were used instead of models, he did not think the student could imbibe so correct a notion of the object to be produced or delineated. This was called *la théorie de développement*, but the plain English meant nothing more than making flat surfaces into round and angular forms (as models now made from sheets of paper). If this description of education could be given, he would take the pupils educated in that department and give them three guineas a-week. He would afterwards raise them to foremen with salaries of 500*l.* a-year, and that would be far better than remaining all their life at the bench, earning 30s. a-week. Machinery could now be obtained to do all the unintellectual drudgery of mechanism. He was not opposed to machinery, and had no apprehension that it would supersede skilled intellectual handicraft. He would employ machinery to do all the drudgery that degraded the workman into a beast of burden. He would give him higher views of mathematics: he would show him that he was an intellectual, thinking being, with a soul for high and immortal things.

Mr. Russell concluded, amid cordial applause, by expressing a hope that Government would seriously undertake the education of the working man, so as to enable us to maintain our superiority among the civilized nations of the world.

THE METROPOLITAN MAIN-DRAINAGE.

ACCOUNT OF THE WORKS TO BE UNDERTAKEN IN CONSTRUCTION OF THE SOUTHERN HIGH-LEVEL SEWER.*

As anticipated in our last notice of this matter, the Metropolitan Board of Works at their meeting on Friday in last week, decided that their engineer should at once proceed with the drawings and specification for the Southern Outfall Sewer, intended to convey the sewage from the point at Deptford, at which are to be the works for the temporary outfall and storm-water outfall, which we particularly described, to the reservoir, pumping-station, and outfall at Crossness Point, in Halfway Reach, midway between Woolwich and Erith. We now continue our account of the intended Southern High-level Sewer, or rather sewers, tracing their course upwards from the Broadway, Deptford, where the "main line" and the "Effra Branch" are to be regarded as separate constructions, being at different inclinations, though still for some distance parallel on plan.

Looking at the main line, we have first a length of 9,500 feet, from the Broadway, Deptford, along the New Cross-road, and thence past St. Mary's Church, Peckham, to the White Post-lane Sewer. This length is to be barrel-sewer of 10 feet 6 inches clear diameter, and to have a fall of 1 in 2,248. Where the sewer passes under the North Kent Railway, the thickness of the work for 70 feet in length is to be 2 feet 3 inches, enclosed in a further solid mass of brickwork—the whole in cement. The abutments of the bridge which there crosses the railway, are to be carried down below the level of the sewers, for a width of 30 feet. Where the sewer passes

* See page 371, *ante*.

under the London and Brighton Railway, a length of 100 feet is to be 22½ inches thick, enclosed in solid brickwork in cement, making up 15 feet 3 inches in width. The remainder of the length, or 9,330 feet, is to be of brickwork, 18 inches thick. As generally throughout the sewers, the upper half is to be in mortar, and the lower half in cement,—with a segment of the lower *half*, of Staffordshire blue bricks, half-brick thickness as lining, or of glazed stoneware blocks, as may be decided upon. The existing sewer in the New Cross-road, is to be broken up, and the drains flowing into it, are to be connected, furnished with flaps. Where the sewer crosses the brickfield, between St. Mary's-road and Slough-lane, it is to be surrounded with concrete, 2 feet thick, for a length of 300 feet, and banked up both sides with earth.

From White Post-lane Sewer the Main High-level Sewer passes to Victoria-road, Peckham, through and under Hanover-street, a length of 1,790 feet, where the inclination is 1 in 2,248, the diameter 10 feet 3 inches, and the thickness of brickwork 18 inches, the work being, as elsewhere, embedded in concrete. From Victoria-road, along Hanover-road, and under West Lodge, Lyndhurst-road, the sewer passes to Camberwell-grove, a length of 3,320 feet, in which the inclination is 1 in 2,248, the diameter 10 feet, and the thickness of the brickwork 18 inches. Thence it passes under the houses, 10 and 11, on the west side of Camberwell-grove; through the gardens between them and Grove-lane, along De Crespigny Park-road; as already stated, crossing Denmark-hill-road; under the third house to the north of St. Matthew's Church; through gardens and land, and part of two houses in Denmark-road, across Cold Harbour-lane and Denmark-street, to Lilford-road, and thence along Holland-road to Loughborough-road. The length of this portion is 4,750 feet; the inclination 1 in 2,248, and the diameter 9 feet 9 inches. The brickwork for about one half of the length is 18 inches in thickness, and for the remaining half it is 13½ inches. From Holland-road the sewer passes along the Loughborough-road, to the "White Horse" public-house, Brixton-road; and the length is 1,190 feet, the inclination 1 in 2,248, the diameter 9 feet 3 inches, and the thickness of the brickwork 13½ inches. Crossing the Brixton-road, the sewer thence passes along Robert-street, Park-street, and Love-walk, through an old candle factory, and the gardens and premises formerly occupied by the late Alderman Farebrother, to Stockwell-road, a length of 1,870 feet. The inclination of 100 feet of this is 1 in 100; and that of 1,770 feet is 1 in 590: the diameter is 6 ft. 3 in.; and the thickness of the brickwork as before. Through Stockwell-green and Stockwell Private-road to the Bedford Arms, Clapham-rise, a length of 2,970 feet, the inclination is one in 205; the diameter 5 feet; and the thickness of the brickwork 9 inches. Along High-street, Clapham, a length of 310 feet, the sewer is to be of egg-shape—5 feet by 3 feet 4 inches—of 9-inch brickwork and invert blocks of stone-ware, the inclination being 1 in 205. From the lower end of Bowyer-terrace, along High-street to the termination at the "Plough," Clapham, a length of 1,740 feet, the form, construction, and thickness, are to be the same, whilst the size is to be 4 feet 6 inches by 3 feet, and the inclination 1 in 100. In all these cases the sewer is imbedded in concrete, level in bed, and bounded by upright sides.

The "Effra Branch," commencing at the Broadway, Deptford, opposite Clarence-place, and taking, first, a course which may be called parallel to that of the principal sewer, arrives at Dennett's-road, a distance of 6,250 feet, by an inclination of 1 in 352, the diameter in the clear being 8 feet 3 inches, and the thickness of the brickwork 13½ inches, except under the railways, where it is 22½ inches in one case, and 18 inches in the other, and where the construction otherwise is like that already described for the main line of sewer. From Dennett's-road, through private land, the line along the Cemetery-road, Nunhead-green, and Nunhead-lane, and across Peckham Rye Common, to Peckham Rye-road, a length of 4,990 feet, will have the inclination 1 in 240, the diameter 8 feet, and the thickness 13½ inches. Thence along East Dulwich-lane to Goose-green, and across private lands to Lordship-lane; a length of 2,030 feet, will have an inclination of 1 in 240, a diameter of 7 feet 6 inches, and a thickness of 13½ inches. Along Lordship-lane the length of 1,550 feet will have an inclination of 1 in 176, a diameter of 7 feet 3 inches, and thickness as before. From Lordship-lane the sewer will pass through private property, to the burying-ground at the south end of Dulwich (1,000 feet of this length having to be tunnelled), and then through Dulwich along Back-lane and Croxted-lane to the Effra Main Sewer, at the junction of the Norwood Branch; the total length being 7,350 feet, the inclination varying from 1 in 176 to 1 in 480, the diameter being 7 feet in the clear, and the thickness, except in the tunnel, 13½ inches. For the 1,000 feet in tunnel the thickness is to be 18 inches, wholly in cement; and the vacant space round the sewer, hard up to the timbering or maiden earth, is to be filled in solid with bricks and tiles, bedded in Portland cement. For the construction of the tunnel, shafts, not less than two, are to be sunk, each 7 feet in diameter, and 18-inch work, the bricks in mortar and all headers; and these shafts are to be domed over, and furnished with grates, to serve for permanent ventilation.

At the upper end of this Effra Branch Sewer, where it joins the open Effra, the sewer will be for 30 feet in length, of egg-shape, 4 feet by 2 feet 8 inches, and 9 inches thick, in cement, with invert of stoneware blocks; and the inclination will be 1 in 5. The 30 feet length will terminate in a head wall, beyond which will be an open invert, for 10 feet, at the same inclination, in cement and blue bricks, ending at the bottom of the present stream or sewer.

The concrete to be provided at the spandrils, side walls, and under the inverts of the different sewers, is estimated at 75,000 cubic yards. Additions or deductions from that quantity are to be priced at 6s. 6d. including every expense of putting in.

The specification comprises, besides what has been spoken of, a considerable amount of work in bell-mouthed and otherwise formed junctions of existing sewers, some of which, like the Ravensbourne Sewer, have to be reconstructed for certain portions of their length. There are twenty-seven of these bell-mouthed junctions, and five other junctions. The formation of these is carefully explained by drawings. The meeting parts of the inverts are coped with granite. The present Effra Main Sewer at the "White Horse" publichouse, Brixton-road, is to be connected with the new sewer by a bell-mouth, and about 75 feet of circular brick sewer, 8 feet in diameter; gradually tapering into the existing form of the Effra Sewer, which is 8 feet 2 inches by 10 feet 2 inches. The bell-mouth at the connection with the new sewer is to be covered with arches of blue bricks, carried by iron girders,—the crown of the new sewer inside being here about 5 feet below the surface of pavement. The construction at the junctions appears to vary in every case, from the difference of dimensions and form in the branch sewers, and from the arrangement of side entrances and ventilators.

The ventilating-shafts, inclusive of those over side-entrances and bell-mouths, are seventy-eight in number; but exclusively of the shafts in the tunnel at Dulwich. They are to be 3 feet in the clear, in 9-inch brickwork in mortar. The aggregate length of these will be 1,000 feet. They are simple shafts, on the present principle. There will be thirty-six side entrances, variously formed, and 200 gullies, each trapped by a bend in the stoneware drain-pipe from the receiver. The 12-inch pipe specified amounts to 1,000 feet; the 9-inch to the same quantity; and the 6-inch, to 6,000 feet. There will be stoneware oblique junction blocks,—500 6-inch, 300 9-inch, and 200 12-inch; and stoneware drain-mouths, with galvanized iron flaps,—100 6-inch, 50 9-inch, and 50 12-inch.

The materials and the manner of executing the works have been carefully specified. The bricks, picked stocks, and the blue bricks or salt-glazed stoneware blocks, are to be equal to specimens; no broken bricks are to be brought upon the works: the bricks are to be well wetted before being used, and the mortar-joints next the interior surface of the sewer, are not to exceed three-sixteenths of an inch. The sand is to be river sand, unless other is sanctioned; and the lime is to be blue lias—as Barrow, or Aberthaw. The cement is to be the best Portland, ground extremely fine, and weighing not less than 110 lbs. to the striked bushel, and is to be capable of maintaining a breaking weight of 400 lbs. seven days after being made in an iron mould, of the form and dimensions as shown in one of the drawings, and immersed six of these days in water. The cement is to be brought on to the works only in small quantities; and is to be mixed—usually one of cement to one of sand, no cement being used which has become hard or set. Brick blocks, put together in boxes, are to be generally 18 inches in length, and are not to be fixed till they have been made at least a week—having remained two days in the boxes. Punning-in to the trenches is to be executed in layers of earth, of not more than 6 inches in thickness.

The contractor is not only to give all notices to companies and authorities, when authorized to proceed, and to provide shoring and be responsible for accidents, but he is to make terms with owners, lessees, and others, compensating them whether for loss of trade or for any other sort of interference. Messrs. Kingsford's mill must be stopped, compensation being given to them. Pumping-machinery and all other temporary contrivances are to be provided for the works and the protection of the public. Tunnelling, only such as may be allowed by the engineer, is to be executed. Existing old sewers met with are to be filled up where required, and house-drains and water-courses now draining into those sewers are to be connected with the new sewers.

The general conditions extend to twenty-six clauses, all drawn up with care and precision. In these, provisoes are inserted for liquidated damages of 5*l.* per day for non-removal of condemned materials after notice; or, unless unavoidable, for obstruction of footways by rubbish. The works are to be finished in twenty months from date of the engineer's order to commence, the damages for each day beyond the time being set at 50*l.* Advances are to be at the rate of 80*l.* per cent. till the works are half completed, and variously afterwards.

In the prices for extras and omissions, digging, with every expense, is set down at 2s. 6d. per yard cube, and without cartage at 2s. Filling and carting away earth or rubbish, any distance, is 1s. 6d. The brickwork of stocks and Portland cement is set down at 14 guineas a rod, in half brickwork at 15 guineas, and in the blue bricks at 24*l.* Work in the picked stocks in lime mortar is 11*l.* 10s. Memel or Riga timber left in trenches is put at 2s. per foot cube, and driven in sheeting piles, at 4s. 6d. Cast-iron work in girders is at 10s. per cwt. and in side-entrance flaps at 18s. The lime is at 1s. 1d. per bushel, and the cement 2s. 3d.

The drawings include a most interesting sheet of sections of borings which were taken in March last, seventeen in number, along the lines of the two sewers. With the assistance of borings on other lines of the sewerage, the Metropolitan Board of Works will shortly be in possession of a geological map, and sections of the London soil, of the greatest value.

We have now given our readers, what is after all only a sketch, however carefully compiled, of a most important division of the Metropolitan Main Drainage. The High-Level Sewerage is first commenced in order to relieve the Low-level districts. It will be apprehended, however, that the complete attainment of this object requires the immediate prosecution of the outfall sewer, and of the pumping arrangements at Crossness Point, and even more urgently than the relief of the northern high-level was required; and this outfall extension—best under the actual state of affairs—having been decided upon, doubtless will be quickly commenced.

THE DRINKING-FOUNTAINS ASSOCIATION COMPETITION.

THE committee have not begun very well. They followed our advice to a certain extent, and invited Mr. Digby Wyatt to assist the committee in their selection. Mr. Wyatt, assenting, attended a meeting, at which he learned that several designs had been admitted at a later date than was named in the advertisement, the 25th of May, and in a way that he could not approve of. Accordingly, and much to his credit, he at once wrote a note, stating that he should be happy to assist the committee at any time if he could be assured that the drawings to be adjudicated upon had been duly received at a date antecedent to twelve o'clock p.m. on the 25th ult. The designs, however, had been so mixed up together, that it was alleged to be impossible to state which had, and which had not, been sent in in time. The chairman (Mr. William Hawes) resigned, and the committee broke up in a "muddle." The following circular shows how they have tried to get out of the difficulty. What satisfaction it may give an artist to allow him the option of withdrawing his design if he thinks himself ill-used, we cannot quite see. It is just one of those cases in which, through carelessness in the first instance, and want of proper appreciation in the second, professional men are treated "like dirt."

This is the circular referred to:—

"SIR,—From a slight inadvertence in drawing up the advertisement offering premiums for designs by this association, a *few* artists and others have sent designs after the 25th of May, and the committee have decided to include such designs in adjudication. If, however, on this account you desire to withdraw your plans, be

pleased to communicate such wish by letter per return of post.

As some designs were received with mottoes, the committee appointed me to open such letters, in order to forward this circular.

I shall therefore retain them sealed in my possession, and *not* sit upon the adjudicating committee.—I am, Sir, &c. S. GURNEY."

What the circular means by "a slight inadvertence in drawing up the advertisement" we do not understand. The advertisement is perfectly clear;—the designs were to be sent in "on or before the 25th."

The Drinking-Fountain Movement in the City.—At last week's meeting of the City Sewers Commission a report came up from the General Purposes Committee upon a proposal by the Public Drinking-Fountains Association to erect a fountain in front of the Royal Exchange. The committee understood that the property of the fountain would be vested in thirty trustees, under conditions to which they could see no objection, and they therefore recommended that such trusteeship should be recognized, the commissioners reserving to themselves the power of removing the fountains, if desirable. They also recommend the court to defray the expense of the water supply to the Royal Exchange fountain. The report was agreed to.

Fountains for New York.—At the meeting of the board of councilmen of New York city, on the 9th May, the following resolution was carried with but one dissentient voice:—"Resolved: That the Croton aqueduct department report to this board, as soon as possible, plans and estimates for the placing of 500 drinking-fountains or hydrants in the streets and squares of this city; such fountains to be used for drinking only, and to be under the supervision of the Croton board."

ART AND ENGINEERING ABROAD.

(From our own Correspondents.)

A NUMEROUS detachment of military workmen of the French Government have just been installed at the Caserne de Lourcine, for the purpose of constructing camp ovens for baking bread, &c. on a large scale.

It is proposed to give to the Paris bridges handsome tablets, inscribed with their names, engraved so as to act as useful indicators to strangers, who are very apt to mistake one bridge for another, and be led out of their way. They are to be panelled with Genoa serpentine, and will contain the names of the constructors, also the sovereigns under whose rule they were erected.

A few days ago one of the two steam-tugs, or dredging-boats, at work at the ancient piers of the Pont du Change, struck against a pile and foundered. The engineer had just time enough to open the safety-valve and mount on deck. The clearing away of the old foundations is rather a tedious affair, there being at least 1,000 piles under each pier, which must be all extracted, as also the stones around them. The dredger takes up from thirty to forty per day.

A plaster model of the statue of Tronchet, by M. Hippolyte Ferrat, is now exhibited in the grand court of the Council of State of Paris. A letter, addressed from Burgos, the 18th November, 1808, by the Emperor Napoleon I. to the Minister of Justice, Regnier, ordered a marble statue of Tronchet to be there placed. Tronchet, the first compiler of the Code Napoleon, was thus honoured by the first emperor, who had an opportunity of personally appreciating "les grands talents," as he says, "dans les conférences qui out eu lieu lors de la rédaction du dit code."

On the Paris and Vincennes Railway, the works of which are now drawing to a close, the viaduct on arches, reaching from the Passage des Quinze-vingts, near the Place de la Bastille, as far as the Rue de Rambouillet, in the very Faubourg St. Antoine, presents a curious aspect, at once novel and ingenious, perhaps correct in a *strategic* point of view. All the piers of these eighty or a hundred arches are open, by means of jack-arches, to thoroughfare or passage, from one arch to another, along the length of the viaduct from end to end.

At the station in course of erection near the Place de la Bastille, fronting the enlarged Rue de Lyons, for a width of 200 mètres, and the projected Boulevart de Reuilly, the first story of the ground-floor has been raised. It is expected to be terminated on the 15th of August, the *fête* of the emperor.

Mons. F. C. Sebille, at Nantes (Loire Inférieure), carries on the manufacture of leaden pipes tinned inside and outside, by their being made to pass through a bath of melted tin, from which they emerge completely covered with the latter metal, all pores and cracks filled up, and proof against any oxidation. This is not a new process, but the first application to practice, in France, on a large scale.

The *Courrier de l'Isere* announces that a decree has ordered, in the town of Viennes of that department, the disengaging, from surrounding buildings, of the ancient temples of Augustus and Livia. Prompt measures are being taken by the municipal authorities for carrying out this design.

After a long delay, caused by the exigencies of the war and its preparations, the railway from Aubagne to Toulon was opened to the public on the 30th May.

The Cherbourg papers announce that works have actually commenced for a line to join the railway station with the ancient arsenal, running along the quay at the east of the basin. It will be principally used for transporting coal.

The shareholders of the Aix and Maestricht Railway have unanimously resolved to raise a capital of 350,000f. by the issuing of preference shares, to provide for the expenses of carrying out the undertaking. It has been decided that application should be made to the Governments for an advance of two years' interest on the working capital.

The opening of the Baden Baths took place on the 1st inst. This season promises to be very brilliant: on the 20th ult. the number of strangers amounted to 200. H.R.H. the Princess of Prussia has arrived, and is likely to make a long *séjour*. Since last year new buildings have sprung up in every direction in Baden. Twenty-five new villas have been erected in the Lichtenchal-avenue, vieing with each other in comfort, luxury, and splendour. Important changes were made during last winter in the railway terminus, with great improvement in the arrangements for public accommodation.

The old kiosque of the promenade is replaced by a new one of a very elegant form, under which the band, playing three times a week, is stationed.

On the 20th April last, a decree was published by the Tuscan Government, reducing to 10 soldi per 1,000 litras the duty on exportation of worked marble. This duty was fixed, by the decree of 17 Dec. 1854, at 10 soldi per 100 litras. The soldo = 0 fr. 4·2 centimes, or $\frac{42}{100}$ of a penny English, nearly. La litra = 340 grammes.

The submarine cable between Gothland and the Swedish coast was successfully laid on the 17th May.

The opening of the Exhibition of the Works of Living Artists, at the Hague, took place on the 23rd May. The number of works exposed amounts to 700: those of foreign schools are more numerous than in former years. There are some Italian works.

It appears that it has been decided to establish, in Madrid, a railway by horse traction, on the system of Galy-Cazalat. Starting from the *Plaza de Chamberi*, one branch is to run as far as the *Puerta de Bilbao*, and another in the direction of the grand circular road, following the line of the *Puerta de Recoletos*, the promenade of the same name, the *Puerta de Atocha*, the Alicante railway, the circular road as far as the *Puerta de Toledo*, where it divides into two branches, one leading to the Canal Wharf, and the other to the *Plaza de la Constitucion*.

This line has been conceded to the Tramway Company, represented by its director, General D. Emilio Laloubere, and will soon place the north and south of the capital in useful and active communication. The works are under the immediate superintendence of D. Manuel Guendias.

ALL SAINTS' CHURCH, MARGARET-STREET.

SIR,—The decorations in the chancel of All Saints', Margaret-street, to which Mr. Street refers in his letter, were executed from the designs and under the superintendence of Mr. Dyce. It was thought reasonable to entrust to that distinguished artist the decoration of a portion of the church, which was in such close proximity to, and might have such important bearings upon, his magnificent frescoes. The intent of his work was to harmonize the frescoes with the decorations and painted glass already existing in the nave. The yellow glass in the chancel clerestory was added in consequence of the injurious effect upon the frescoes of the cold bluish light which streamed through those windows before the alteration. INDEX.

Bells.—Hitherto the west end of London has been rather indifferent about its church-bells; some churches having one, others having two, and so on. "All Saints' Church," Margaret-street, recently illustrated in these pages, has lately received three bells, which are ultimately to form a peal of eight. Those now hung are the 1st, 4th, and 8th, or tenor, weighing one ton and a half in the key of E flat. The frame is made to contain a peal of eight, and it is to be hoped the Committee will not be long before they will have them completed. The casting of these bells was entrusted to the Messrs. Warner and Sons, of Cripplegate, and the tone is said to be good.

The Marble Work.—We learn that all the marble and alabaster work, the pulpit, font, screen, shafts, and inlaid work, on walls, and elsewhere, were executed by Mr. Field, of Parliament-street, and gladly mention it. Some of this work is new (to us of the present day), and he is entitled to great credit for the manner in which he has performed it.

THE ASHTON INFIRMARY COMPETITION.

THE committee have selected the design marked "*Nil Desperandum*" for the first premium, found to be by Mr. Joseph Lindley, of their own town; and the design marked "Experience," understood to be by Mr. Haley, of Manchester. The first design is Elizabethan in style. From a review in the Ashton *Reporter* we judge that the views we have set forth on hospital construction, and our advocacy of the pavilion principle, have influenced several of the competitors. How far the committee have acted in accordance with them we have yet to learn.

THE MUTUAL LIFE ASSURANCE SOCIETY

KING-STREET, CHEAPSIDE.

THE building shown by our engraving has been erected for the Mutual Life Assurance Society, which was established, in the year 1834, to carry out the pure principles of mutual assurance. It now ranks amongst the first offices, and has a steady annual increasing business. The society appears to be conducted in an economical and efficient manner, obtaining for the assurers the greatest amount of benefit that can be commanded. We desire so strongly to see the advantages of life-assurance extended, that it is always a gratification to us to point to an office in which confidence may be safely reposed.

The new building is in King-street, Cheapside, and stands upon the site formerly occupied by the offices of the society, with the additional ground upon which No. 38 stood, altogether comprising a frontage of 57 feet. The front external wall is built with Portland stone, and the windows to the ground floor have rusticated quoins with semi-circular heads; and upon the key-stones to the arches are carved heads, representing the four quarters of the globe—that to the centre window the head of Time. The entrance-door to the building is near Cheapside, and has a bold projecting cornice carried upon trusses enriched with carved swags of fruit and flowers.

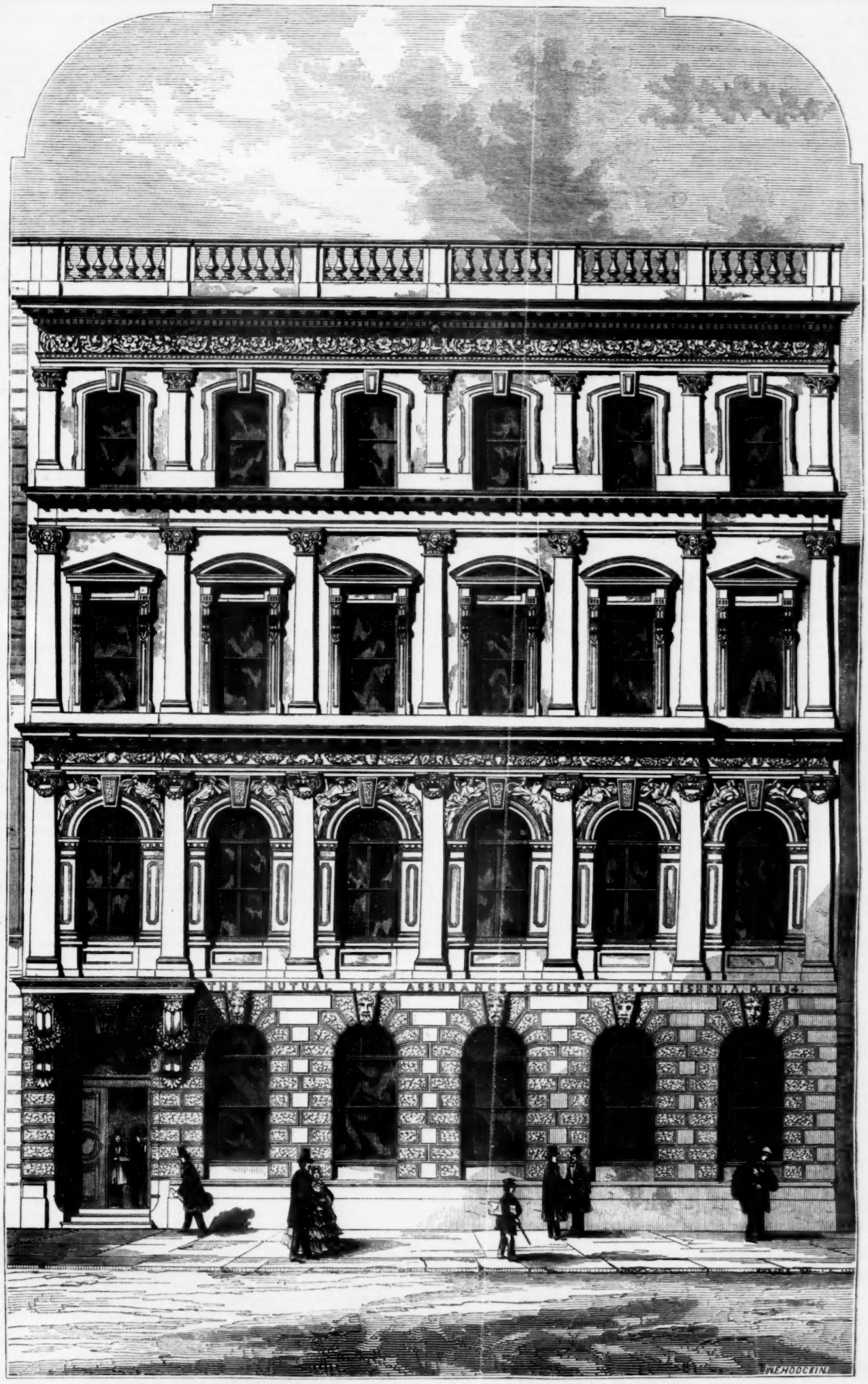
The first floor consists of a range of semi-circular headed windows, compassed with Ionic pilasters, and swags of flowers hanging from the volutes of the caps. The cornice to this story is enriched, in the frieze, with carved festoons of fruit and flowers, hanging shields, and wreaths of oak and laurel.

In the spandrils, formed by the archivolts of the windows, are emblematical figures of History, Industry, Justice, Mercy, Peace, Plenty, Sculpture, Painting, Faith, Temperance, Music, and Poetry, which are partly in *alto*, and partly in *basso rilievo*.

The second floor windows have pedimented heads, with trusses and architraves, and this floor is divided, like the first, with pilasters with carved caps, consisting of volutes and leaves, between which are heads. The third floor is divided like the last with pilasters, and windows with architraves, and the front is surmounted by an enriched cornice, having the frieze filled in with a scroll, in centre of which is a shield.

The internal arrangement of the building on the ground floor consists of entrance-hall, public office, actuary's room, and waiting-room; the whole divided by mahogany screens, glazed. On the first floor are the board-room, and directors', medical, and waiting rooms. On the basement floor there are two strong rooms, offices, and rooms for papers, and a messenger's room.

The design was selected in a limited competition of six architects, and is the work of Mr. John M. K. Hahn, of Newgate-street. The works have been carried out by Mr. George Myers, and the carving by Mr. Redduck, for Mr. Myers.



THE MUTUAL LIFE ASSURANCE SOCIETY'S OFFICES, KING-STREET, CHEAPSIDE.—MR. JOHN M. K. HAHN, ARCHITECT.

DECLINE OF ARCHITECTURAL DRAWING.

NEVER having followed the arts professionally, but merely as an assistant, in certain departments of trade, especially that of architectural ornaments, and having been regularly admitted into all the schools of the Royal Academy, I still continue, as an old student, to enjoy a free admission at all times to the different schools, the library, and exhibition-rooms, particularly where architecture forms a prominent feature. Taking a retrospective view in my mind of the general state of the fine arts, as exemplified in the various metropolitan exhibitions during certain periods, say every ten years, a gradual and decided improvement is unquestionably taking place. If it were possible to measure or weigh the exact quantity of talent in one entire exhibition at the Royal Academy, we should find the collective amount of merit, each year, greater than that of the year preceding. This remark applies equally to oil and water-colours, at all the exhibitions in London and elsewhere. If I follow the same train of examination to pictorial architectural drawings,—that is, to perspective views either of existing buildings or imaginary designs—the result is not quite so satisfactory as in other departments of the graphic and plastic arts. The architectural draughtsmen, as a body, are not making the same slow, gradual, and certain advancement in the right direction, which is so evident amongst the painters and sculptors. I tremble at the very idea of retrogression in a body of liberal-minded men, uniting together, in the most friendly manner, for mutual improvement: I also exert my utmost energies against falling imperceptibly into a habit of telling long stories, to the present generation, of the many wonderful feats that "we did, when we were young,"—

> "Goodnatured, harmless, kind grey-headed men,
> Arrived at more than three score years and ten,
> Talk of their youth, and marvels they did then."

Yet I cannot persuade myself to believe that the generality of drawings now exhibiting at the gallery in Conduit-street, display as much artistic judgment and execution in the effects of light, shade, distance, and aërial gradations of tone in colour, &c. as were displayed in the drawings of a former period, perhaps twenty or thirty years since.

On looking at the architectural drawings in the Royal Academy Exhibition, I am disposed to consider they are altogether better; that is, they display far more artistic ability than is to be found in Conduit-street. In conversation with a gentleman belonging to the Royal Academy, I inquired respecting the small number of architectural subjects exhibited in their rooms: his reply was, that the greater number offered were so deficient in merit, as pictures, that, in the opinion of the judges, they would be almost wholly without interest to the public, and certainly not very creditable to the authors of them; and that the hanging committee found it necessary to put a few oil paintings and other subjects amongst the architectural drawings, to induce visitors to go into that room; otherwise it would be empty and unnoticed, except by a few architects or builders. The idea immediately flashed across my mind,—Can this be one of the reasons why there are so few visitors in Conduit-street? for I have been there several times lately, on purpose to examine attentively the general merit of the drawings as works of art, and found I could do this without interruption, for the galleries were nearly deserted: occasionally two or three individuals might be observed to stroll in, buy a catalogue, carry it about without opening it, gaze round in a queer sort of incoherent manner during about a quarter of an hour, and walk out as if they had lost themselves, were bewildered, or had made some grand mistake.

I have sometimes ventured, in a very friendly manner, to remonstrate with my young friends about their flat, tame, feeble, and almost shadowless perspective drawings, which have been prepared expressly either for some world-wide competition, or else to be hung in a public exhibition room, perhaps close to a powerful and effective picture, which by contrast will make my friend's performance look still more in want of strength. The mild remonstrance has generally been answered by, "Oh, I only drew the outline. I got Mr. —— to tint it. Architects now hardly ever shade or colour their own designs." I hear this mode of obtaining assistance is very frequently adopted in modern times; and if it were an improvement upon the past—if better drawings were produced—if the end were more successful—it might be but of little importance what means were resorted to for the purpose of gaining a favourable and honourable result. Judging from appearances and frequent trials, this modern practice seems to be a step in the wrong direction; not because there are no artists fully capable of making clever architectural drawings, but because highly-talented artists, even if they are disposed to work second-hand, require higher remuneration for their services than their cousins of the rule and compasses can afford to give: consequently the latter are obliged to put up with the help of an inferior artist; or if the clever man can be pressed into the service, the pay is so trifling that, in justice to himself, he is obliged to get through the work most expeditiously, and determines not to touch the drawing after the architect says "It will do." In this species of manufacture the artist loses no credit by the performance, because his name is altogether withheld from the public.

If these architects ever were able to make their own drawings; being out of practice, the hand, and the judgment, too, become as it were paralyzed, or unskilful, and thereby incapable of either making good drawings, or knowing whether they are cleverly made for them. It may be considered as an invariable rule, that if ever an artist ceases to improve, either from his own indolence or other cause, he cannot put a drag to the wheel, or make a dead stand-still: if he do not go forward, he is sure to go back at a rapid pace, and in all probability without having the most remote idea of his own retrocession, although it may be evident enough to his friends and admirers.

I do not presume to interfere in matters of taste, composition, colouring, or any of those undefined qualities in a picture, which admit of a wide diversity of opinions; but I object to whatever is a stretch beyond the bounds of possibility in nature; such as light shining, with equal intensity, on more than two sides of a polygonal building, at the same time; and many other defects, not of a doubtful species, but of a positive and definite kind.

I have a horror of being classed amongst those anonymous critics who, although unable to paint pictures, conceive themselves at full liberty to judge them, and who treat the artist, whether good or bad, as an animal whom everybody is privileged to attack. By not particularizing individual works, I hope to avoid giving offence to any one: each artist may therefore enjoy the peculiar felicity of believing his own performances to be entirely free from the defects which have been mentioned, and discriminate, perhaps for the first time, glaring faults in all other pictures. It is in our nature to consider advice as something very like presumption, bordering upon insolence to our understanding, which we are all tenacious of having doubted, or of having our discernment called in question, especially after having "arrived at years of discretion." Notwithstanding truths may at times be disagreeable, in some cases they are indispensable; but should I have expressed myself in warm or harsh terms, I can conscientiously assert that my earnest desire is to do good; and that a little friction is always required to produce the most beautiful polish.

C. H. SMITH.

THE BRITISH ARCHÆOLOGICAL ASSOCIATION.

THE concluding meeting of the present session was held on Wednesday evening last, at 32, Sackville-street, Piccadilly; Mr. Pettigrew, F.R.S. in the chair.

The formal business having been disposed of, and several interesting relics presented, including the original letters patent granted by William and Mary for the manufacture of calico, muslin, and fine cloth produced from wool of the growth of British plantations in the West Indies, equal to those brought from "Calcutt" and other places in the East Indies,

The Chairman called attention to a letter which he had received that day from Mr. Thomas Wright, giving a description of the discoveries at Wroxeter, and inclosing a drawing of a capital recently found amid the excavations at that place. The latter was a good deal mutilated, but sufficiently perfect to show that the Roman houses were not wanting in architectural ornament. Mr. Wright stated that they were at present excavating a very extensive mansion, with a court 40 feet square, paved with small bricks in herring-bone fashion, with apartments at the side 10 or 12 feet square, which would appear to have been shops or workshops. The capital, which was 3 feet high, had been found in the outer court of this mansion. There was reason to believe that the excavations would now be conducted with energy, as the Duke of Cleveland, to whom the property belonged, had compensated his tenants; so that two acres of ground could be laid open. The Society of Antiquaries had subscribed fifty guineas towards the excavation fund, and it was to be hoped that the public would furnish whatever remaining funds might be required to develope and bring to light these interesting remains of Roman art. The chairman next called attention to a communication which had been received from an Associate in the Isle of Wight, relative to the discovery of a Roman villa near Carrisbrook. These remains, which promised to yield a handsome reward for the zeal of the antiquary, were discovered on the 28th of April last, when some workmen were digging the foundation of stables for the vicar. The site was about a quarter of a mile from that of the Chatterford villa, discovered some years ago. The permission of the Rev. Mr. James (the vicar) had been obtained, and steps were about to be taken to examine the relics. A tesselated pavement and two floors had already been traced. On the north side a handsome pavement of red, black, white, and stone colour had been found in a room 14 or 15 feet long. At the southern end there was a concrete floor, with a portion of the wall still standing. Among the *débris* were found burnt wood tiles (with the nails still in them), hinges, knives, plaster, bones of horses and sheep, a few Roman coins, portions of a cinerary urn, and many specimens of the external decorations of a Roman villa. These remains were discovered at a distance of 3 to 5 feet of the surface.

Mr. Cuming (honorary secretary) then read an interesting paper on Battersea enamels, a species of manufacture which appears to have perished after a short-lived existence of less than twenty years. Judging from the devices, the fabrication commenced about fifteen years before the close of the reign of George II. and terminated in the third year of the reign of his successor. The subjects were for the most part birds, portraits, &c., and in a few instances landscapes. Of the specimens exhibited to the meeting two contained portraits of George II. and Frederick Prince of Wales: there were also portraits supposed to represent Robert Walpole, Earl of Orford, and Maria, Duchess of Gloucester, widow of the Earl of Waldegrave, and niece of Horace Walpole. Little was known about these fabrications beyond the circumstance that Horace Walpole mentioned them incidentally in his catalogue of the Strawberry Hill Collection. The paste of which the enamels were formed was good, and the drawings were in many instances spirited and well defined. The artists (whose names had perished with their work) portrayed also mythological and pastoral subjects, with a dash of allegory in the representation. But the artificers of Battersea sometimes soared higher, and produced works entirely of enamel, such as snuff-boxes, caskets, &c. (one of the former was produced, representing a gentleman conducting a lady down a terrace, with a little boy in the foreground; the composition of which is extremely pleasing). The Battersea enamels were principally used for the lids of snuff-boxes, bracelets, brooches, window pins, and the like. The colours were for the most part red, blue, or brownish, and although they could not vie with the gorgeous plaques of Sevres, or other continental manufactures, they were still interesting and valuable as specimens of home enamel. A few of these were still to be found in old country houses, but their story remained an unwritten chapter in the history of British art.

Mr. Pettigrew said it was singular that there were so few traces of this art still left. There was no specimen either in the British Museum, the South Kensington Museum, or the Germyn-street Museum; neither was there one in the collection of the late Mr. Bernal.

Mr. Solly observed that he was old enough to remember that a gentleman, a friend of his, wore a set of buttons of Battersea enamel, illustrated with hunting subjects. This gentleman was accustomed to join in the hunting parties of Louis XVI.

A gentleman inquired whether there was any mark by which the Chelsea enamels might be known, similar to that in the Chelsea or Dresden ware.

Mr. Cuming said he had been unable to detect any trade mark. With regard to the scarcity of the ware, he had been to at least fifty collector's shops, and he could not find a trace of it; in fact, the shopkeepers maintained that there was no such thing. Mr. Wilkinson (of the firm of Wilkinson and Sotheby, the well-known auctioneers), had told him that he had never met with a specimen, and at the British Museum they were equally in ignorance of it.

Mr. Gray inquired whether the copper foundation was a peculiarity of Battersea enamels.

Mr. Cuming replied in the negative; — all enamels had a metallic base.

Mr. Pettigrew next read a portion of an elaborate and erudite paper by Sir Gardner Wilkinson, one of the vice-presidents of the society, on the rock basins of Dartmoor. It referred to the inquiries of Mr. Ormerod, and to the conclusion drawn by that gentleman that the basins were of natural formation, and were to be attributed to the decomposition of the granite. The fact that the large basins differed from the smaller ones, and that they were to be found in other rocks besides granite, was, in Sir Gardner Wilkinson's opinion, sufficient to show that their origin was to be traced to mechanical and not natural agency. In support of this theory, he referred to the fact that there was evidence that some of the basins had been filled with peat 150 years ago, to prevent sheep falling in, a precaution which it was evident needed not have been taken had there been a deposit of decomposed granite. Had Mr. Ormerod seen the basins in the granite rocks at Redruth, in Cornwall, he would have observed that they were not natural, but were formed with much art and labour. The sides were 2 feet high, and neither the bottom, which was level, nor the sides had the slightest appearance of being decomposed. They had a lip cut to drain off the water, a proof that they were made by human agency. They were also to be found in rocks, other than granite, as in the Peaks of Derbyshire, in Staffordshire, at the Devil's Punch Bowl in Lincolnshire, and also in Northumberland. It was also a noteworthy circumstance tending to show that their formation was artificial and not natural, that they were to be found in early British remains. It was his opinion that they were connected with the religious worship of the Druids, whose existence it was impossible to deny. Redruth was the head-quarters of Druidism in that part of the country. The paper then referred to the rude concentric rings or circles to be found in the neighbourhood of these remains; expressing an opinion that they were in no way connected with the worship of the serpent, as some persons contended, but that they were intended as boundary lines to keep off the *profanum vulgus* from approaching too close to the rites of the priests. Mr. Pettigrew having eulogised the great labour and learning which Sir Gardner Wilkinson had devoted to the subject, announced that the paper, together with the accompanying drawings, would be published *in extenso* in the Transactions of the Society.

Mr. Gould said he did not agree with Sir Gardner Wilkinson in attributing the rock basins to human agency; and mentioned that, in the year 1823, he had visited the falls at Powerscourt, in Wicklow, and observed that the volume of water fell into a basin precisely similar to those described in the paper just read. Being of opinion that the basin was formed by the action of the water on the stone, he stripped, and, having searched the pool, picked up a fragment of granite as round as a cannon-ball—a clear proof, in his mind, of the manner in which the basin had been scooped out.

The thanks of the meeting were then awarded to Sir Gardner Wilkinson for his communication.

Mr. Pettigrew announced that the next congress would be held at Newbury, in Berkshire, under the presidency of the Earl of Carnarvon, and would continue from the 12th to the 17th of September, inclusive, this period (somewhat later than usual) having been fixed in the hope that Parliament would have concluded its labours by that time.

THE ARCHITECTURAL ASSOCIATION.

AT a meeting held in the rooms at Conduit-street, on Friday the 27th ult. Mr. T. M. Rickman in the chair, Mr. Randall Bruce read a paper on—"The Necessity of a greater Power of Artistic Drawing among the Architects of the present Day, and the important Means to that End that the 'Class of Design' ought to and might become."

The writer urged that the designs produced depend much more upon the power of artistic drawing possessed by the architect than some were willing to admit, and maintained that originality and variety come more naturally when the hand is capable of portraying whatever the eye sees, or the imagination prompts: he afterwards dwelt forcibly on the advantages the Class of Design offers. We would add to his, our own most earnest recommendation of this means of improvement. Every student-architect should join this, or some similar class immediately, and be contented to fail again and again, as the only means of acquiring power to succeed.

Class of Design.—On June 3rd, the president of the class (Mr. R. Druce) in the chair, various designs for cemetery chapels were contributed by Messrs. Druce, Lewes, Sheldrick, and Ough. The half-hour's sketch was a "Well-cover." Some remarks were made in the course of the evening with reference to the prizes to be offered for the best series of sketches contributed to the class during the session, which subject will be brought forward at the special business meeting of the Association on June 10th. "An Organ Case" will be the subject for the sketches for the last meeting of the class this session, June 17th, on which evening the election of the officers of the class, and the selection of the subjects for the sketches for the ensuing session, will take place.

IMPROVEMENTS IN KENSINGTON.

THE Government are busy pulling down the cavalry barracks, at Kensington, near the turnpike. Now, it was a suggestion of the late Sir James M'Adam, that whenever these were removed, it would afford the opportunity of continuing the carriage-drive on the south side of Rotten-row into Palace-gardens, whereby the Queen would be able to drive from the park through Palace-gardens without, as at present, passing through the High-street, Kensington. It would of course take off a slice at the bottom of Kensington-gardens; but as that part is little used, we do not apprehend any objection to the proposed improvement would arise on that head. It would be an advantage to others as well as to the Queen.

STAINED GLASS.

Westminster.—On the death of Mr. Germain Lavie, auditor of Christ Church, Oxford, a committee was formed, consisting of Vice-Chancellor Sir W. Page Wood and others, to collect subscriptions (limited to two guineas) for the purpose of erecting a memorial window in Christ Church, Westminster, of which Mr. Lavie was a churchwarden at the time of his death. The work has been executed by Mr. O'Connor, under the directions of Mr. Butterfield. It is in the south aisle, and consists of two lancet lights, with a trefoil as tracery above them. In the two lancet lights are represented two enthroned figures of David and Solomon, with three panels beneath each, giving three principal events (on a smaller scale than the enthroned figures) from the lives of each of them. The three under the figures of David are—1. David in the character of shepherd rescuing the lamb from the lion. 2. His being anointed by Samuel. 3. His encounter with Goliah. The three subjects under the figure of Solomon are—1. The Vision, in which he requested of God an understanding heart. 2. The building of the Temple. 3. The meeting with the Queen of Sheba.

Stourbridge.—A stained-glass window is now being placed in St. Thomas's church, Stourbridge. The subject is the Unbelief of St. Thomas, in which the apostle satisfies himself of our Saviour's resurrection. The other apostles are grouped round the unbeliever. At the top and bottom there is a trefoil intersected with vine-leaves. The window has a thirteenth-century border, in which vine-leaves are also introduced. Its height is 18 feet, and breadth 8 feet, a size which has rendered its execution rather difficult: indeed, it is said to be the largest piece of stained-glass work in any church in the midland counties. The manufacturers are Messrs. Chance, and the designer Mr. S. Evans.

Bury St. Edmund's.—The work of filling the west window of St. Mary's, Bury, with stained glass, has now been completed by Messrs. Heaton and Butler, of London. The window was commenced as a thank-offering for the abundant harvest of 1854, and some of the lights were filled soon after. By the liberality of individuals, provision has been made for the chief part of the remainder, but there still remains a deficiency in the funds to defray the whole expense. The subjects of the west window, which contains two tiers of five lights each, and a heading of perpendicular tracery, are described in the *Bury Post*:—"In the upper centre light Christ and his disciples in the corn-fields under a canopy of vine foliage with inscription. In the lower centre light the Crucifixion. In the upper side-lights are eight panels on grisaille ground, with flower-work, containing the Six Acts of Mercy, and our Saviour restoring the blind to sight, and feeding the multitude. In the lower side-lights are the figures of St. Peter and St. Paul next the Crucifixion; and the Agony in the Garden, Christ bearing his Cross, and seated figures of the Evangelists, in the outer lights. In the lower compartments of the tracery are angels with scrolls. Above these are the emblems of the Redemption, and of the Evangelists, and other Christion symbols, the Dove surmounting the whole. The artists have laboured under considerable disadvantage in the piecemeal execution of this work, owing to which they had not the opportunity of viewing the progress of it as a whole, and it is not, therefore, so perfectly harmonious in its effect as might have been desired."

East Witton.—In the parish church of East Witton, which was built by the late Marquis of Ailesbury, there has just been erected an east window of stained glass, the gift of the Marchioness of Ailesbury to the church. The window is one of five lights, representing our Lord in Ascension in the middle, with the four Evangelists, one in each side light. Underneath the figures of the Evangelists are appropriate passages from each of their Gospels. The lower panels and the canopy are worked in colours, and the tracery is filled with angels bearing scrolls, and with coloured foliage. The window is the work of Messrs. Lavers and Barraud, of London.

IRELAND.

THE requisite works for the lighting of the town of Mullingar with gas progress under the superintendence of Mr. P. Dooner. Mr. R. L. Johnson, patentee for the manufacture of peat gas, is contractor for the iron-work.

We are told that considerable improvements are about to be made by the Midland Great Western Railway Company in the approaches to their station at Mullingar.

With respect to barracks, we receive complaints of the indifference with which the published opinions of scientific men regarding sanitary improvements are treated, particularly as to ventilation, heating, and lighting. There are many barracks in Ireland to which no attention whatever has been paid in this respect.

SCHOOL-BUILDING NEWS.

THE foundation-stone of the boys', girls', and infants' schools, at Winchmore-hill, Middlesex, was laid on the 27th ult. by Mr. C. T. Busk, assisted by the Bishop of Carlisle and Mr. R. Hanbury, jun. M.P. The buildings comprise an infants' school, 44 feet by 18 feet; girls' school, 33 feet by 18 feet; and a boys' school, 40 feet by 18 feet, with entrance porches, forming a receptacle for hats, coats, &c. prior to entering the school; to which is also added a sink, with a constant supply of water. A class-room is provided to each school, in accordance with the instructions of the Council on Education, who have promised a liberal grant. There is also a house for the master, with bell-turret. The style of the whole is Gothic. The buildings are now progressing under the superintendence of the architect, Mr. Charles H. Edwards. The contractors are Messrs. Pickard and Co. of Caledonian-road.

School buildings have been erected in the new village or town of Stantonbury, between Wolverton and Newport Pagnel. The style is Early English. A church is also in course of erection. The architect of both is Mr. Street.

CHURCH-BUILDING NEWS.

Little Cawthorpe (Lincolnshire). — The first stone of the new church was laid by the Incumbent, on Monday last. The building is to be wholly of brick inside and out, without plaster, and will consist of a nave, chancel, vestry, and porch, with tall spirelet. The site is on a hill opposite the Vicarage. The architect is Mr. Withers, of London, and the builder, Mr. Clark, of Louth.

Wantage.—East Challow Church, which had become very dilapidated, has within the last twelve months been all but rebuilt, except the chancel, which was restored by Mr. J. S. Gillmore, the owner of the great tithes. The interior is now supplied with moveable benches, increasing the accommodation by ninety-six sittings. The aisles and the floor of the chancel have been laid with tiles. The design was by Mr. G. A. Bevin, of London, architect; and the works were executed by Mr. Hunt, of Wantage, builder. To complete the building a tower is still required. About 350*l.* or 400*l.* are still wanted for this purpose.

Newbury.—The work of building a new district church has been commenced, on a site at the upper end of the town, near that part called the "City," and adjoining the road leading towards

Greenham. The church will afford sittings for 500 persons. Mr. Myers, of London, is the contractor.

Llanllawen (*Pembrokeshire*).—The works at the new church are progressing, and will be roofed in during the summer. The design comprises nave and chancel under one roof, with spirelet at the intersection; south porch and vestry on north side of chancel. The material used is local stone, with Bath stone dressings. All the seats will be open, and uniform throughout. The builder is Mr. James, of Llanychaer; and the architect, Mr. Withers, of London.

Derby.—St. Peter's Church, Derby, has been reopened. The three huge lofts or galleries have been removed. The western arch has been thrown open, and the organ removed from the chancel and placed within it. The flat ceiling has been taken down, and the timbers of the roof have been varnished and renewed where necessary. The columns supporting the clerestory on the north side being very insecure have been entirely rebuilt, and those on the south side restored. The church is paved with tiles, laid upon a bed of concrete, and seated with benches. The plaster and whitewash which encrusted every part of the walls has been removed, and the stonework repaired and pointed. The glass in all the windows has been coloured amber. The church is lighted by gas standards supplied by Messrs. Skidmore, of Coventry. The restoration has been carried out from the designs of Mr. Street, of London, by Mr. Wood of Derby.

JEWS' HOSPITAL COMPETITION.

THE referees, Messrs. Digby Wyatt and Mocatta, have completed their award, which is now under seal in the hands of the secretary, as is also the key of the room in which the designs are. No one but themselves has been allowed to see them, we believe; not even a single member of the committee. There are thirty-three designs, and many of them are very good, the majority thoroughly well studied on plan, but not many well proportioned architecturally.

ELECTRO-TELEGRAPHIC PROGRESS.

GOVERNMENT are ready to guarantee the Atlantic Telegraph Company a dividend of 8 per cent. per annum for twenty-five years, provided the cable is in successful operation and capable of conveying 100 words an hour; they will also pay 20,000*l*. per annum for messages. The company are, however, to enjoy the benefit of the original arrangement for a payment of 14,000*l*. per annum from the United States Government. They intend to guard by a policy of insurance against accidents or loss from the process of submerging the cable, and also that the contract for the manufacture shall be accompanied by provisions for its efficient electrical working for a considerable period. The new capital is to consist of 600,000*l*. in 5*l*. preference shares.——Another Atlantic Telegraph company, it is reported, is being formed for the purpose of laying a cable from Cornwall to Canada. The proposed capital is 500,000*l*.; and it is anticipated that the shares will be readily taken up, as the company will be unencumbered with debt. It is proposed to lay down two cables of peculiar construction, on the principle of secondary insulation, and with improvements suggested by the failure of past experiments. The cable consists of the usual coil of copper wires insulated with Manilla hemp and india rubber or gutta percha, and exteriorly covered with hempen rope alone instead of metal, not twisted spirally, but close woven on the sash-line principle. The new company, it is asserted, do not intend to go for a guarantee.——Mr. J. B. Lindsay says,—"Yesterday (May 17) I telegraphed successfully [without any crossing line or telegraph wire] across the Tay opposite to Glencarse, where it is about half a mile broad. The action on the needle was strong, and the same battery power would cross, I think, at Broughton Ferry."——The Red Sea cable, it is believed, is, probably, by this time, safely laid down from Suez to Perim, when only 100 miles will remain for its completion to Aden. The second section will be from Aden to Kurrachee, where we shall at once be in communication with every part of India. The cable for this purpose is in course of construction.

TASTE IN DRESS.—We hear that in Munich feeling has been roused to the institution of a committee for the reform of attire, and the head man of the movement is Kaulbach, the artist.

DUBLIN WATER!

SIR,—By your last publication we learn that "Belfast has assumed the initiative in the drinking-fountain movement," and, in justice to the stirring townspeople there, I must suggest by way of supplement—in many other things likewise. The water we drink here—when we can get it—is none of the purest or wholesomest, although both its quality and mode of supply have been a *quæstio vexata* for some years past, and our corporation orators have made long speeches on the subject. Reports, numerous and voluminous; plans, various and well digested (no doubt), have come under public notice, and yet matters remain pretty much in *statu quo*. It seems we require a daily supply of 12,000,000 gallons for our "city," and yet, surrounded as it is by canals and perpetual mountain streams of clear crystal *aqua*, there appears to be an actual difficulty in giving us the wherewith to drink. The committee, No. 2, of the Municipal Council have called in the aid of Mr. Hawksley, an eminent engineer (as you are aware), and upon his report have come to the following resolution:—"That this committee are of opinion that it is necessary and expedient the corporation should take measures to procure for the citizens of Dublin an ample supply of water of a better quality and description than at present supplied to them; and that it should be delivered at 'high pressure,' and on constant service, in the manner now being universally adopted in the cities and large towns in England and Scotland." To effect this, it is proposed to borrow from Government 150,000*l*. at 4 per cent. Would that the *high-pressure* system in this instance were directed in the proper quarter. For though the corporation have been "taking measures" for years past, we as yet see no practical results; and as for the enormous outlay proposed, and the consequent taxation, they are both unnecessary, and must prove detrimental to an already over-taxed city. First improve the system of filtration in the reservoirs—which is palpably defective—say I:—this can be effected at a comparatively small cost;—and then regulate the required supply by proportionate pressure from the present sources, which are the most convenient, natural, and economical.

As to public drinking-fountains we have *none*, nor does there appear to be a desire that we should have any: a few pumps—that run dry occasionally—are distributed here and there, but their construction precludes the possibility of a thirsty soul getting a refreshing draught therefrom, unless he brings a vessel with him; and there is no trough for animals. Pray, urge our sluggish corporation—now that the warm weather is coming—to give these matters their earnest and immediate attention, and devote themselves in preference to *necessity* rather than embellishment. A CORRESPONDENT.

Dublin.

HOW THE HULL CEMETERY COMPANY GOT A DESIGN.

SIR, — Much has already appeared in your valuable journal in exposure of the mal-practices of the cemetery and other boards in obtaining and adjudging designs, but though a constant reader I do not remember observing any case of the nature of that to which I now beg to draw your attention. The facts are briefly as follow:—The Hull General Cemetery Company having resolved to erect an additional chapel on their grounds at Spring Bank, Hull, advertised for tenders for the same;—particulars of the works to be obtained of Mr. Shields, at the cemetery. The builders, on making application to inspect the plans and specification, are coolly informed that they must visit a small Gothic chapel recently erected from the designs of a Hull architect, at the village of Newland, a mile distant, and take their quantities from that building, as the required chapel is to be "exactly the same size and pattern" in every respect; except that what is an attached Sunday school in the case of Newland is to have a division wall in the cemetery chapel, and be appropriated to the purposes of a robing-room and dead-house. Thus, sir, these worthy and wise directors of the Hull General Cemetery Company may claim the credit of inaugurating a new system of obtaining designs, without even offering a 5*l*. premium! or exposing themselves to the well-merited odium generally consequent thereon. They can also further lay claim to the virtue of economy, by saving (query) the amount of an architect's commission; although they do cause a poor builder the annoyance and vexation of being denied, at the office of the architect whose design they appropriate, the loan of his drawings and his specification to estimate from, and although they do incur the risk of being considered by the profession scarcely up to the mark as exemplars of true rectitude, high principle, and honour. BETA.

VENTILATION OF SCHOOLS.

THE COMMITTEE OF COUNCIL.

SIR,—Having had a paper forwarded to me from the Committee of Council on Education, being instructions to promoters and architects of school buildings for their ventilation, I am of opinion that its principle is wrong, both in theory and practice. The paper referred to is to be found "appended to General Report, by Rev. H. Mosley, her Majesty's Inspector of Schools, in minutes of Committee of Council on Education, of 1848-49-50, vol. ii. p. 38." In speaking of this ventilating apparatus as used at the National School of Hyde, near Winchester, the paper states that "Each school-room has been constructed with an ordinary fireplace, measuring about 3 feet 6 inches wide. The hearth, paved with tiles, is raised about 2 inches above the floor level, and extends into the room about 4½ inches. In the middle of the hearth an ash-pit has been dug about 15 inches in depth, about the same in length, and about 9 inches in width. The ash-pit is covered with a moveable grating, on which the fire is made. The draught of the fire is supplied by a cold-air drain, which enters the ash-pit from under the floor, and into which there are two openings, in opposite parts of the room, so that the air consumed in the fire is supplied from the room itself."

Thus it appears that the rooms are to be ventilated by air drains which draw the air downwards: this is only the lowest stratum, and this is the part of the system that I consider wrong. It is a well-known fact that all vitiated air, being lighter than pure air, immediately ascends, and if not allowed immediate escape, it cools and mixes with the other air, and in that state I have no doubt some little will find its way to the air drains; so that, instead of true ventilation, it has quite the contrary effect, and stops any natural ventilation that might exist.

Also the fresh air supplied to the rooms will come in through or very little above the floor. It being a moving current, the greater part will flow at once to these outlets intended for the foul air, and thus leave the foul air in a stratum about the right height for breathing, owing to the two attractions—that is, the vitiated air wants to ascend, and does, but cannot escape: the air drains draw it down, the fresh air rushes in between, and keeps it stationary.

I think the apparatus and system would be perfect if the air for feeding the fire were conveyed by pipes having their openings close to the ceilings, instead of in the floor.

I have been induced to make the above observations from the fact that the system I condemn is getting into practice. E. BEATTIE, Jun.

THE NINE-HOURS MOVEMENT.

SIR,—The address from George Potter, the secretary of the amalgamated trades, in Saturday's *Builder*, June 4, will fill many a mechanics' heart, as it does mine, with fear and sorrow: since I have read it, I have hardly had a wink of comfortable rest, for we and our wives must look forward to the *great evil*; and the Lord then have mercy upon ourselves and little ones, for a strike of one or two or more months will heap misery upon us, disarrange all our present comforts, and involve us in debts that it will require many a year to set to rights. If Mr. Potter and other delegates had not interfered, and sought to make the men discontented with their present easy condition, there would not be distrust between master and man. This is what destroys the mutual good feeling that one ought to have for the other. I, for one, deny that the mechanic, in his "physical comfort and social independence, in regard to the masters," is retrograding. The address alludes, in the first instance, to machinery as a main cause. This is an old cry. But I thought it was well known that machinery does not lessen the demand for labour: on the contrary, by increasing supply at a cheap rate, it creates a market for production, and, in consequence, demand for labour. Now it is well known, that machinery in our trades relieves the mechanic from the very lowest class of work, and is applied mostly to the sawing. That occupation of saw—saw—saw, all the day long, is above all apt to dull any man's capacities, for nothing could be more wearisome. As for miserable dependance and social slavery, no mechanic was certainly ever so low as at present; but in a different sense from what the address means. We are in subjection, truly, for a man dare not take a job; he dares not settle for wages; he dares not work over-time, and many other like things which would find him more money, unless he does them under the control and at the bidding of the union, and this not only in regard to himself, but to his own fellow-workmen. Is this freedom? Do not the mechanics exercise the most cruel tyranny over each other? Have I not known the man refuse to work with his own master on the same scaffold, because he was not of the union; and did not they threaten to strike if he went on? Is this free trade? Why may I not work over-time to help finish a job out of hand in which time presses, and where no relay of other hands could take up our work and carry it on? and why may I not earn a few extra shillings to buy boots for my wife, a frock

for my girl, or a new cap for my boy? Is this freedom? Why am I obliged to pay my three-pence and more a week to the union, which never did me any good, and which goes only to maintain others in idleness, and keep up agitation? Is this freedom? When I attend the amalgamated meetings, as I am forced to do, or I shall be a marked man, I see Mr. Potter and other members of the committee. They are not in rags, they are dressed as well as any gentlemen. There is no pinching want in their cheeks; and when I look around and see my fellow-workmen about me, they are generally strong, hale, and hearty, never better able to do a full day's work,—none of your wizeny chaps like the clerks in offices. Ten hours a day too much for a man to work at such healthful labour! Are there not twenty-four hours in the day? I give ten hours to work, two hours to meals, say eight hours to sleep. Are not the remaining four hours enough for self-improvement and to pass with my family, and see how Jack can write, and Molly read? What class in working society has more to spend with their families? I understand that lawyers and doctors, and a pack of such folks, would be glad of four spare hours to rest their minds in. Am I not sure of my wages every Friday night, or Saturday afternoon? What's the case with my master? Has not he been running about all the week to get the money to pay me? As soon as he has cleared the wages, often have I heard master say, "I know not how I shall meet the next week to pay my men." And then comes some turn, they say, in the money market, and the papers tell us of higher interest. Still we receive our wages all the same. We do not lose, though master does; and when we are out at a distant job, he often sends us in a cart, and brings us home in like manner, and our other like comforts for meals are attended to. And yet we are told to look on our masters as task-masters. Whereas, if we do not do as the union likes, if we wish to act independent, we are hooted and hunted out of our work.

But as regards ten hours' work being too much for an able-bodied man, what other class of workmen have ever set up such a foolish pretence? I recollect my father, who was a farm-labourer, getting up through the summer at four o'clock every blessed morning, and remaining away at work ploughing, reaping, and mowing, all day: my little sister or I often took him something warm for his dinner from my mother, but generally cold bacon and bread was his fare; and he used to return at seven or eight o'clock at night. Yet he did not complain, if he could make the two ends meet. We can have wholesome food, and enough of it, if we are frugal with our present wages; and what with the public schools and dispensaries, and our club, and conveniences of the baths and wash-houses for our wives to work in and soon get up our washing for the family, we can meet all our wants, enjoy our comforts, bring up our children, and might be contented and happy if Mr. Potter and his delegates would let us alone. This movement will be our ruin, and bring misery to our domestic hearths. God help us in His mercy, and make our real task-masters Christian men.

A WORKING MAN.

THE LATE FATAL ACCIDENT AT THE WESTMINSTER PALACE HOTEL.

THE adjourned inquest was resumed yesterday before Mr. Bedford and a jury of fourteen gentlemen.

Mr. Serjeant Ballantine appeared for Messrs. Myers and Son, the contractors of the building; Mr. Sturgeon, barrister, and Mr. Moseley (a solicitor), for the representatives of some of the deceased persons.

Mr. Ashpitel acted as foreman of the jury.

William Richardson, civil engineer (examined at the last inquiry) was the first witness called. He said:—I attended by request of the solicitor for the family of one of the deceased persons at Mr. Myers's yard, to witness experiments made by hydraulic pressure on a piece of timber which was described as one of the unbroken transoms. I found it to be 21 feet 6 inches long by 9½ inches deep, and 5¼ thick. I saw the hydraulic press applied to it, and if the apparatus be correct, the pressure was equal to three tons. A piece of wood 3 feet long by 2 or 2½ inches thick, and about 10 inches deep, was placed in the centre of the scantling, and the pressure was applied as near as possible in the centre of that piece. This caused the wood to deflect something like four inches. I should state, the timber was perfectly sound, and that as far as I could see, none of the fibres had given way.

To the Coroner.—Then what is gained by the experiment?

Witness.—That the timber would carry three tons.

The Coroner.—Any more?

Witness.—Yes. I think the transom would have borne a steady weight of four tons. I can give no opinion as to whether the engine or the weights were correct, but I have no doubt they were.

To a Juror.—I was told by Mr. Myers that the piece experimented upon was taken indifferently from the next scaffolding. It was a better piece of timber, and less knotty, than one which broke. The transom that broke was an inch less in thickness than the one I saw tested.

To Mr. Sturgeon.—The transoms that broke were, I think, 9 inches by 4½, and 9 by 4¾. I should not consider a piece of timber with 4 inches deflection would be dangerous to use, provided there were no vibration or oscillation.

To the Foreman.—If the weight had been distributed equally all over the transom, it would, I should think, have borne four times the pressure?

The Coroner.—Was there any external appearance of knots on the transoms that were broken?

Witness.—There was; but they were not bad timbers. The timber experimented upon was manifestly better than the broken transom; but Mr. Myers said it was selected as that which was next to the one which broke, and therefore I consented to its being tried.

To a Juror.—I have no reason whatever to doubt the fairness of the experiment, nor do I believe Mr. Myers would tell a lie on the subject.

Mr. William Coleman, 14, Cowley-street, Westminster, and the general foreman of the works, deposed as follows:—I have been several years employed as a general foreman, and have seen a good many scaffolds erected. The scaffold in question was erected partially under my superintendence. The foreman of Scaffolders (Patrick O'Neil) acted under me. The appointment of foreman of scaffolders depended upon the magnitude of the job. I told O'Neil that I wished him to take the lead of so much scaffolding. This was about three or four months before the accident happened, and I referred to the western portion. He had a gang of scaffolding men under him, numbering from ten to twenty. The foreman of scaffolders is chosen in consequence of his experience. He would know a sound from a rotten piece of timber. I sent for the timbers which formed the stage in question. I sent for five transoms. O'Neil did not ask me for six either before or after they came. Five was the number we both agreed upon, and subsequently O'Neil told me that he had made six transoms by splicing two pieces of timber together. I said, "So much the better." It occurred to me that the span of 20 feet between the transoms was a long span; but I thought it perfectly safe. It would probably have been better to have put a strut at each end. The planks used were inch-and-a-half thick and 12 feet long. I think the centre planks lapped upon the ends. I do not recollect any one ever remarking to me that there was a spring or a crack in one of the transoms. No one ever said to me that if the stage was loaded any more it would fall. I often told the men to go down the ladders, and not jump on the stage. I see the men daily jumping on the stages, perhaps twenty or more at a time. There is never any jumping on the stage when the men are returning from dinner. I have no doubt but that the jumping on the stage tended to weaken it. I was not spoken to about the stage that fell on the evening before the accident; but Mr. Myers, jun. spoke to me about putting another stage up higher. I objected because the work had not been brought up to the level; besides, I wanted all the men I could find to get up iron joists, of which we took up forty-nine that evening. We got up a few barrows of stuff on the stage that evening. The last I heard of the stage was the planking it with the boards from the under-stage. I saw the stage at eight o'clock on the evening before the accident happened; but I cannot tell what quantity of stuff was upon it. I never was called to see a crack in it. I did not know that the lower stage was removed, further than that some of the planks had been taken away; and I remember telling O'Neil that they could easily be removed. I have seen the transoms that broke, and, although they have knots in them, they are not what could be called knotty. There could not have been much stuff on the stage that fell, as the men were otherwise engaged, and could not load it. I might have said to O'Neil, "Paddy, I'll give you a shilling a week, because you are foreman of the scaffolders." He knew he had the shilling a week as foreman. It was not given to him because there was a strike at the works at the time. The putting up a scaffold similar to that which broke down is not essentially a carpenter's job.

Cross-examined.—Darcy was discharged because he was lazy, not because he gave evidence here. I caught him reading newspapers when he should have been at work. I will positively swear that I never was told that the stage was insecure. I cannot tell why Warren, the bricklayer, was discharged. Taverner, one of the witnesses who gave evidence at the last meeting, has been sent to another job. My duty as general foreman is to order all material, and look after the work generally. I never discharged O'Neil from this job, nor do I know that he was eight days doing no work. I had not been drinking the night before the accident; was as sober as I am this minute.

To Mr. Sergeant Ballantine.—Mr. Myers gave me orders that the lower stage was to remain intact, as a workshop.

To a Juror.—If O'Neil said he did not know he was a foreman, it would be quite untrue. There was never any difficulty in getting good or ample materials for the works.

John Woodley, 48, Leamington-street, Vauxhall-bridge-road, foreman of the bricklayers.—No man named Hayes told me that if I did not stop the stuff going upon the stage there would be a break-down. Between two and three o'clock on the day before the accident, I told him not to bring up more stuff until the stage was cleared. There were then about 1,500 bricks on the stage, and a little mortar. I saw Mr. Joseph Myers the night before the accident, and I told him the men had been complaining that the stage was unsafe. Previous to this, Mr. Myers had asked me whether it was usual for the men to work overtime in getting up bricks, and I told him they were allowed to do so by the society. Mr. Myers subsequently ordered a new stage to be made, and Mr. Coleman (the last witness) said he could not spare the men to do it, because he wanted the men to get up iron joists; moreover, he said the walls were not properly squared up. I never said to Hayes, "You must go on loading the stage while Mr. Myers is here."

Cross-examined.—My duty as foreman bricklayer is to see that the men do their work. I remember having said, when I heard that the lower stage had been taken away, that Mr. Myers would be very angry if he knew of it. I consider the stage which fell perfectly safe, as I trusted my life on it every day. The upper stage might have been strengthened by struts from the lower one.

To Mr. Moseley.—A deputation from the workmen waited upon Mr. Myers an hour after the accident, and asked him to discharge me, because they alleged that I had desired the lower stage to be removed. I was then discharged, or removed to another job. I am now in the employment of Mr. Myers.

Mr. George Myers, re-examined by Mr. Sergeant Ballantine, said he did not know until after the accident that the lower stage had been removed.

To the Foreman.—The stage was supported partly by scaffold-poles and partly by transoms.

William Bridgend, bricklayer, in the employ of Mr. Myers, said he remembered the day before the accident, and that he had told Mr. Woodley (the last witness) that he did not like the look of the stage. Next morning he said to Woodley, "What do you think of it now?" and his reply was, "For God's sake, don't say anything more about it." This was after the accident. His attention was called to the stage by seeing it shake. He did not know that O'Neil was foreman of the scaffolders. He did not tell him that he thought the stage was unsafe. He told his foreman, who was the proper person to speak to.

Timothy McCarthy, a labourer, was the next witness. He deposed that the evening before the accident he spoke to Mr. Woodley, the foreman, about the stage being overloaded, and told him that if some of the bricks were not taken from the centre it would come down. Mr. Woodley then sent two men to remove the bricks to the side, where the stage had bearings. The Wednesday evening before the accident he was under the scaffold, and saw a splint rise on one of the transoms. Told O'Neil of it; did so because he was the leading man of the gang, and took orders from the foreman. Saw O'Neil, Mr. Coleman, and Bridgend afterwards talking together, and as they were looking up at the stage, he believed that they were talking of the danger.

Michael Russell, another labourer, was next examined. On the morning of the accident there were about seven or eight tons of stuff on the stage. Assisted in carrying the men to the hospital. On his return, Mr. Joseph Myers, in his hearing, ordered the foreman to send away all the men except six, and to employ them in taking away the stuff that fell. Did not see them do so. The evening before the accident he noticed the insecurity of the scaffolding, and told all the men about it.

The evidence having been brought to a conclusion,

The coroner addressed the jury at some length, pointing out the issues on which they were called to pronounce their verdict. He explained to them the difference between error of judgment and want of skill, and left it to them to say whether the accident was one arising from misadventure or from culpable negligence.

The jury retired, and, after an absence of nearly two hours, announced that they had agreed to the following verdict:—

"We, the jury, appointed to inquire into the cause of the late accident at the Westminster Palace Hotel, which resulted in the death of seven persons, are of opinion that such deplorable occurrence was entirely owing to the accidental falling of an overloaded scaffold on which the unfortunate men were at work. That the jury are further of opinion that there is not sufficient evidence before them to affix the blame of such overloading on any particular person or persons; but that some blame attaches to Mr. Wm. Coleman, in not promptly carrying out the orders he received from his employers to make a new scaffold. And they cannot conclude this most painful inquiry, without expressing an earnest and fervent hope that in all such erections, whether of scaffold or platform, where the lives of persons are likely to be jeopardized, more caution and circumspection should be practised by the workmen in future. And the jury cannot separate without expressing an opinion at the loose, confused, and unsatisfactory manner in which the evidence has been collected and put before them.

Signed on behalf of self and fellow-jurors,

CHARLES T. FOWLER."

Books Received.

Maunder's Treasury of Knowledge. New Edition. London: Longman, Brown, and Co. 1859.

THE old writer who warned disputers to "beware of the man of one book," must have had this solid, varied, and thickly-stored little volume in his mind. At any rate, if a man who had devoted himself to any one book would be a dangerous antagonist, none can doubt that the man who had mastered this book would be particularly so. The present edition, which is edited by B. B. Woodward, B.A. F.S.A. assisted by J. Morris, solicitor, and W. Hughes, F.R.G.S. comprises an English Grammar, an English Dictionary, and a History of the English Language; Directions for Pronunciation and Lists of Scripture Names and Christian Names; English Verbal Distinctions and Table of Abbreviations; Foreign and Classical Proverbs, Terms, and Phrases, with English Translations; a compendious Geographical Dictionary; the Population of the United Kingdom, with other Statistical Tables; Cities, Boroughs, and Market-towns of Great Britain, with the Statistics of each; List of Animal, Vegetable, and Mineral Productions; a Classical Dictionary of Greek and Roman History, Biography, and Mythology; a Compendium of Modern Chronology and History; Correspondence of Eras and Epochs; Synopsis of the British Peerage, with Mottoes, Coronets, Privileges, and Tables of Precedency; Forms of Epistolary Address; a compendious Law Dictionary; Abstract of Tax Acts; Commercial Table of Exchange, Coinage, Weights, and Measures of all Nations; and Scientific and Miscellaneous Tables! Such a body of information, ably conveyed, and obtainable at a cheap rate, needs no recommendation, but simply to be known.

VARIORUM.

IN a reprinted article "On the Action of Hard Water upon Lead, by W. Lauder Lindsay, M.D." from the *Edinburgh New Philosophical Journal* for April last, this interesting and important subject is ably treated of. The singular differences of opinion, or of statement, by different chemists, as to the comparative action of hard and of soft waters upon lead, are here explained to

have arisen, to a certain extent at least, from the indefinite meaning of the terms hard and soft. Thus sulphates of lime, &c. will make water hard, and so will muriates or chlorides of the same bases; but the sulphates may form a crust or deposit with and upon the lead, and so protect it from further action, while the chlorides will not, and may even prevent the sulphates from doing so where both co-exist in the same water. Professor Christison's experiments, which were first of all brought under the notice of the general public in our columns, are confirmed by Dr. Lindsay, while he more pointedly distinguishes the exceptions from the rule. The result of the whole investigation still is that cases of lead poisoning on the small scale, or in a minor degree rather, are constantly occurring in all our large towns from the use of lead cisterns and pipes.

——"Notes on the Defences of Great Britain and Ireland. By Lieut.-General Shaw Kennedy, C.B." (Murray) are said to embrace "the only general and systematic plan for the permanent defence of this country that has been proposed in recent times," and to have been submitted to the criticism of officers of eminent skill in both services, who have unanimously expressed their opinion that they ought to be laid before the public. The author's plan of defence, besides strong forces of men, comprises the erection of detached works of masonry capable of sustaining a regular attack with heavy ordnance, such works to be placed round London, Woolwich, Chatham, Sheerness, Dover, Portsmouth, and Plymouth, each fort at one mile's distance from those next in course. For London alone there would be thirty of these strongholds. It is not for us, however, to decide on the merits of such a plan, or even to describe it at any length.

——As connected with our national defences, we may here note down the title of a small tract comprising "A few Words of Advice to the Mariners of England, and enterprising Youths inclined for the Sea-service; showing the Advantages to be derived by Service in the Royal Navy. By a Seaman's Friend." (Bradbury and Evans, printers.) By contrast with the merchant service, as here shown, these advantages are now certainly great and unquestionable.

Miscellanea.

MUSEUM OF PATENTS, SOUTH KENSINGTON.—Number of visitors for the week ending June 4th: mornings, 922; evenings 901. Total, 1823.

ELECTRICITY IN THE SPROUTING OF SEEDS.—A committee of *savans* have been occupied at Paris in the investigation of the new discovery of Dr. Reybold, opposed by the Academie some time ago. Dr. Reybold's system of applying electricity to the earth itself enables him, it is now said, to force sown grain to sprout in three days. The expense is trifling, and the electric power so great, that a powerful electric shock is felt by applying the hand to the earth acted upon by Dr. Reybold's machine.

FIRE-PROOF COMPOSITION TO RESIST FIRE FOR FIVE HOURS.—Dissolve, in cold water, as much pearlash as it is capable of holding in solution, and wash or daub with it all the boards, wainscoting, timber, &c. Then diluting the same liquid with a little water, add to it such a portion of fine yellow clay as will make the mixture the same consistence as common paint: stir in a small quantity of paperhanger's flour paste to combine both the other substances. Give three coats of this mixture. When *dry*, apply the following mixture:—Put into a pot equal quantities of finely pulverized iron filings, brickdust, and ashes: pour over them size or glue water: set the whole near a fire, and when warm stir them well together. With this liquid composition, or size, give one coat; and on its getting dry, give it a second coat. It resists fire for five hours, and prevents the wood from ever bursting into flames. It resists the ravages of fire, so as only to be reduced to coals or embers, without spreading the conflagration by additional flames; by which five clear hours are gained in removing valuable effects to a place of safety, as well as rescuing the lives of all the family from danger! Furniture, chairs, tables, &c. particularly staircases, may be so protected. Twenty pounds of finely sifted yellow clay, a pound and a half of flour for making the paste, and one pound of pearlash, are sufficient to prepare a square rood of deal boards. When the Chinese were told the risk we ran of being roasted alive in our many-storied mansions, they remarked, "What little land the English must possess, that compels them to build such *high* houses!" J. B. N.

THE CARPENTERS AND JOINERS OF PLYMOUTH. A meeting of the carpenters and joiners of Plymouth and Stonehouse has been held at the Plymouth Mechanics' Institute, for the purpose of helping the society already formed of members of these trades, with a view to place the carpenters and joiners on an equal footing in the receipt of wages and other respects with the mason, plasterer, and operatives in other branches of trade. It was stated that out of their wages, which averaged generally about 18s. per week, they had to find their own tools.

THE BRITISH SCULPTURE WORKING ASSOCIATION.—Under this title *ateliers* have been opened for some patented machinery intended to execute the rough work of the sculptor, either in transferring his modelled design to the stone, or of copying existing statues. Those conversant with the pentagraph used by surveyors will understand us when we state that while by means of a combination of mechanical parallelisms a blunt tracing-point is moved about the model, a rapidly-revolving cutting-point clears away the redundancies of the stone intended to become the statue; and as the point is brought nearer to the model, the cutting-point makes a closer and closer approximation on the hitherto rough mass of stone, till at last the sculptor has little left to perform than to apply the minute and delicate finishing process. The British Sculpture Working Association proposes to raise a capital of 20,000*l.* with Mr. W. Barnes, architect, as the manager and secretary *pro tempore*, for the purpose of producing, by means of the improved appliances indicated, works of good character and execution, at prices within the means of the less opulent.

HOME TOURS.—Our professional and archæological readers will thank us for drawing their attention to the facilities for their advantage arranged by the London and North-Western Railway Company, according to a notice just made public, that "Tourists' tickets, available for one calendar month, will be issued on and from the 1st June to the 30th October, to North Wales and Ireland, Holyhead, Bangor, Caernarvon, Conway, Abergele, or Rhyl; to Windermere, for the Lakes of Cumberland and Westmoreland; the Furness Abbey district; the Lancashire watering-places of Fleetwood (for Belfast, Lough Neagh, The Giant's Causeway, Lakes Erne, Londonderry, &c.), Lytham, Blackpool, or Southport, and the lakes of Killarney, Cork, &c. from the following and other stations:—Euston station, Oxford, Bedford, Northampton, Peterborough, Rugby, Coventry, Tamworth, Leamington, Birmingham, Dudley Port, Wolverhampton, Worcester, Shrewsbury, Hereford." Monthly tickets at reduced rates will also be issued, in connection with the tourists' tickets, to all who desire to resort with their families to the favourite Welsh watering-places on the Chester and Holyhead line. There are also monthly excursion tickets to the Isle of Man during the summer season.

DOCKS, HARBOURS, &c.—A new graving dock is about to be built at Deptford, Sunderland. The dock is to be 310 feet by 60 feet wide, the entrance to have a caisson gate. The contract has been let to Messrs. James and George Young, contractors. The whole is to be carried out according to the plans and specifications of Mr. J. G. Brown, architect.——The Works Committee of the Mersey Dock Board having recommended that the width of the proposed steam dock at the north end of Liverpool be 250 feet, as originally laid down by the engineer, Mr. M'Iver, the principal local partner of the Cunard Company, made a strong objection to the width being less than 300 feet, and gave notice of a resolution to the effect that the committee be requested to state the reason which had led them to make the recommendation complained of.——A new lighthouse is to be erected on the Hanois rocks, Guernsey. Mr. Walker is the engineer. A plan for the extension of the Harbour Esplanades, at Guernsey, through the land under Fort George, whence the filling for the works is now obtained, has been proposed by Mr. Lyster, and submitted to the Secretary of the War Department, by whom it has been approved; and the land has been ceded to the Harbour Committee for the use of the public. —— In two blue books, recently published, is the report of the Commissioners on Harbours of Refuge, from which we learn that three harbours are recommended to be constructed in the Isle of Man; namely, one at Douglas, one at Peel, and one at Port Erin. The Douglas Harbour is to be of 46½ acres at low water. The estimated cost is 100,000*l.* The Peel harbour is to be a simple breakwater, running 500 feet from Peel Castle. The cost is 25,000*l.* The works at Port Erin consist of a pier 400 feet long.

HANDEL AND ST. MARY'S, REDCLIFF.—We learn that at a recent meeting of stewards of the Bristol Handel Centenary Commemoration, the Mayor in the chair, a statement of the accounts was produced, showing a small deficiency, the concerts not having been sufficiently supported by the public, partly in consequence of the general election, and other causes, which materially interfered with the sale of the tickets. It was resolved to raise by subscription a sum to meet such deficiency, and also for the purpose of carrying out the original intention of the promoters, by restoring a window in Redcliff Church as a memorial of the name of Handel. The Mayor, with the Rev. Mr. Young, Messrs. T. Proctor, T. P. Jose, R. Lang, A. Bleeck, S. V. Hare, C. W. Finzel, Jas. Bush, W. Powell, W. Baker, G. Ashmead, J. H. Hirst, and G. W. Edwards, were appointed a committee, with power to add to their number.

BESSEMER'S STEEL.—This day, says the *Mining Journal*, we quote, for the first time, amongst the metallic manufactures of the country, the steel produced by the processes patented by Mr. Bessemer, and we are informed that the new material can be supplied in almost any quantity. The usual price of engineers' tool steel is from 2*l.* 15s. to 3*l.* 5s. per cwt. whilst Mr. Bessemer offers an article, which competent judges pronounce equal to the best, at 2*l.* 4s.; his other kinds of steel being proportionably lower. As to the quality of the article there can be little doubt, since the tests to which it has been submitted at Woolwich have given every satisfaction to the officials; and we understand a contract for a considerable period has been concluded with Mr. Bessemer. It is needless to commend Bessemer's steel to the consideration of our readers.

MEMORIALS.—It has been resolved that a full-length marble statue of Mr. R. Hall, late M.P. for Leeds, be obtained, and, with the consent of the Town Council, placed in the Victoria Hall; the statue to be executed by Messrs. Dennis Lee and Welsh, Woodhouse-lane, Leeds, after a model which they have prepared. The model represents Mr. Hall in his costume of Recorder of Doncaster, addressing the jury. The statue is to cost about 600*l.* and the greater portion of the money has already been subscribed.——It has been determined to erect an obelisk and a statue, in memory of Adam Clarke, the commentator, at Portrush, near the Giants' Causeway, the neighbourhood of his birth-place; also to build a school-church, and minister's house, at Portstewart, near Coleraine, where he was brought up. Two-thirds of the money required for this purpose (2,000*l.*) have been raised, and the proposed erections have already been commenced. The statue of Dr. Clarke has been presented by his admirers in the United States.

SANITARY ARRANGEMENTS FOR THE SOLDIERS IN INDIA.—Having been the first to draw attention to the necessity of looking to the sanitary state of the British soldier in India, and to demand the issue of a commission with that end in view, we were taken to task by certain of our respectable and in general reliable Indian authorities on the subject, and reproached for even hinting at such a thing, although in the very face of fresh evidence sent home in their own columns, side by side with the reproof, clearly showing that we were fully justified in so doing. But perhaps the best evidence that some inquiry and amendment are even now necessary is the fact which has just been announced, that "Mr. Sidney Herbert is to be the Chief in a Commission, to consider the sanitary arrangements for the protection of the British soldier in India."

A NEW FIRE-ESCAPE.—Mr. John Ottignon, of 59, High-street, Bloomsbury, has obtained a provisional registration, under the Designs Act, of a new fire-escape, which consists of a metal cradle or basket, to be retained within a balcony screen at a window, and slung by means of a chain or rope, passing over pulleys and a miniature crane, and running through the house, either to the back premises, or from floor to floor, to a heavy counter-balance weight to which it is fastened. Another chain or rope is attached to the bottom of the basket, in order to be thrown into the street, to enable those present to aid in either pulling down the basket, swerving it to some other window, or keeping it off projections. Except when in use, the escape is hooked to the balcony, and the chains are kept in the bottom of the basket. How the counter-balance is disposed of, ready for action, however, does not appear from the specification; but of course it can readily be kept slung with a portion of the chain attached, the junction with the escape portion being easily effected near the escape itself.

SWEEPING CARPETS WITHOUT DUST. — There was lately exhibited, at St. George's Hall, Liverpool, a patent carpet-sweeper; consisting of a cylinder of four radiating brushes, revolving in a wooden box, which has metal ledges on both sides; the brushes acting as shovels to receive the dust and dirt. A long handle is attached by a hinge to the box, which runs upon four metal wheels at the corners; and in the middle there is a larger wheel multiplying the revolutions of the brush axle or cylinder, and thus increasing the rapidity of its action.

EXHIBITION OF 1861.—The following resolutions have been passed by the council of the Society of Arts:—"Resolved,—That with reference to the present and prospective condition of the Continent, the council is of opinion that the International Exhibition proposed to be held in 1861 should be postponed to a more favourable opportunity. That this resolution be communicated to his Royal Highness the President of the Society, and to her Majesty's Commissioners for the Great Exhibition of 1851. That the chairman be requested to prepare a report of the proceedings which have been taken by the council to ensure the success of the intended International Exhibition of 1861, together with an explanation of the grounds on which the council has come to the conclusion that the Exhibition should be postponed to a more favourable opportunity. That the chairman's statement form part of the annual report to be laid before the Annual General Meeting on the 29th June next. That the foregoing resolutions be communicated to the Guarantors." This decision is much to be regretted.

TESTING THE STRENGTH OF IRON BEAMS.—On April 18, there were some experiments at Trenton, N.J. on the strength of iron beams made for the Government, at the rolling-mill of the Trenton Iron Company. The beam is in the usual form, the stem 6 inches high, and a ¼-inch in thickness, and 3 inches wide at the top and bottom. The beam was 12 feet in length between the bearings, and the pressure was applied in the centre by means of a powerful hydraulic press. Under a pressure of 6,500 lbs. there was a deflection of about ½-inch, but on relieving it from pressure the bar sprang back to its original position. An addition of 500lbs. showed a slight set, which continued to increase until at 10,500 the set was 2½-inches, and an addition of 500 lbs. warped and twisted the bar, showing that its ultimate strength was designated by 10,500 lbs. The beams are for the roof of the Custom-house at New Orleans, and are being made under the direction of Major Anderson, U.S.A., who superintends the Government work at this place. The beam tested yesterday is of a new pattern, weighing only 39 lbs. to the yard, but calculated to sustain great weight—gaining strength without increasing the weight inconveniently. — *U.S. Railroad and Mining Register.*

FUEL FROM STEAM, AND STEAM FROM THAT FUEL.—An apparatus for the decomposition of water, and combustion of the hydrogen thus obtained, has been invented by a M. Meudt, according to *Galignani*. The apparatus, it is said, consists of a small copper boiler, with a safty-valve and a pipe passing into a tubulated bottle with two necks: thence another tube passes under the boiler. About half a gallon (two litres) of water is poured into the latter, and about half a litre of weak tar-water into the tubulated bottle. A spirit-lamp applied to the boiler sends steam into the bottle, where it is said to give its oxygen to the tar. The hydrogen of the steam thus accumulates in the bottle, and then passes under the boiler back to the spirit-lamp. A sort of perpetual motion is described as being the result; for the spirit-lamp being taken away, the hydrogen generated burns with its own flame, and makes the water boil: this engenders fresh steam, which is decomposed as before, and furnishes a new supply of hydrogen, which feeds the flame, and so on—not *ad infinitum*, but—until the water in the boiler is exhausted. This discovery is actually said to have been already applied to steam-engines and locomotives! The decomposition of steam by "tar-water" deserves a Bishop Berkeley to celebrate its wonders. The whole thing reminds us of a semi-jocular proposal which we once made in the *Builder*, that heat should be produced by friction till it could boil water, with the steam of which new heat might be evolved by frictive apparatus wherewith to produce new steam, &c. any surplus steam power to be used as required! This idea was seriously entertained by some French mechanician or engineer—it may have been M. Meudt himself,—and at least this new idea is closely akin to it.

COMPETITION.—The Scotch Church, near Regent-square, is about to undergo some alterations. A select competition has just been decided in favour of Mr. Gibson.

SOCIETY FOR THE ENCOURAGEMENT OF THE FINE ARTS.—The fifth conversazione of this Society was held at the Architectural Gallery, Conduit-street, on Wednesday evening, when some papers were read, interesting, but too long.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.—At the closing general meeting of the session, to be held on Monday evening, the 13th of June, the following paper will be read:—"On the General Theory of Proportion in Architectural Design, and its Exemplification in Detail in the Parthenon," by Mr. W. Watkiss Lloyd.

PROPORTIONS OF ANCIENT BUILDINGS.—Dr. Henszlmann announces a volume, entitled "Méthodes des Proportions dans l'Architecture Egyptienne, Dorique et du Moyen Age." The prospectus says:—"The exactness of the discovery made by Dr. Henszlmann is proved by the reports of three different commissions,—one in England, named by the Royal Institute of British Architects, and two named by the *Comité de la langue, de l'histoire et des arts*, in France." This is surely saying too much so far as the report, made by the Committee of the Institute of Architects, is concerned. If we remember rightly, that report was worded very cautiously, and was far from certifying to the exactness of the discovery. The prospectus quotes one of the other reports alluded to, signed by M. Albert Lenoir, wherein it is suggested that the system of proportions discoverable may be founded on revelation,—may be dated from the form of the tabernacle given by God to Moses, and the plans for the temple at Jerusalem received from God by David.

TENDERS.

For works for the Blackwall Railway Company:—

Peto and Brassey	£24,800 0 0
Lucas	21,186 0 0
Piper and Son	20,489 0 0
W. Lawrence and Sons	19,830 0 0
Brass	18,839 0 0
Jay	18,089 0 0

[Sir,—When quantities are furnished, how comes this fearful difference?—INQUIRER.]

Alterations, &c. to the Eagle Insurance Office, Bridge-street, Blackfriars. Mr. H. Currey, architect. Quantities by Welch and Atkinson:—

Cubitt and Co.	£4,350 0 0
Lucas	4,292 0 0
Trollope	4,247 0 0
Mansfield	3,950 0 0
Ashby and Horner	3,940 0 0
Piper	3,893 0 0
Holland and Co.	3,883 0 0
Lawrence, Brothers	3,740 0 0

For the erection of the premises of Messrs. Philips and Son, Chart Publishers, South John-street. Messrs. J. W. and J. Hay, architects:—

Robert Wells	£4,528 0 0
William Tomkinson	4,433 0 0
James Burroughs	4,416 0 0
Kilpin and Montgomery	4,297 0 0
Parker and Son	4,127 0 0
Holme and Nicol	4,124 0 0

Parker and Sons accepted for the masonry, and Holme and Nicols for all the other branches.

For building a pair of villas at Boltons, West Brompton, for Mr. J. Keating. Mr. Thomas Burton, architect:—

Ashby and Sons	£3,345 0 0
Lawrence and Sons	3,342 0 0
Conder	3,300 0 0
Piper and Son	3,297 0 0
Mansfield and Son	3,204 0 0
Brass and Son	3,193 0 0
Downs	3,160 0 0
Stimpson	3,150 0 0

For rebuilding the mansion at Trueloves, near Ingatestone, Essex. Mr. Wm. White, architect. The quantities supplied by Mr. Samuel Field:—

I'Anson	£2,830 0 0
Holland	2,697 0 0
Nixon	2,687 0 0
Wood	2,540 0 0
Higgs	2,300 0 0
G. Mansfield and Son	2,300 0 0

For new schools and master's residence at Haslington, near Crewe, Cheshire. Mr. James K. Colling, architect:—

Samuel Faram, Odd Rode	£1,455 14 6
Lockwood & Farrimond, Chester,	1,335 0 0
(No name.) Booth-lane Head, Sandbach	1,272 0 0
Edward Hughes, Liverpool	1,230 0 0
John Buckley, Davenham	1,080 0 0
John Preston, Newcastle, Staff.	1,075 0 0
Richard Boughey, Nantwich	1,068 5 0
Daniel Bloor, Newcastle, Staff.	880 0 0

For works at St. Matthews' Church, Brixton. Mr. Edward Ellis, architect:—

Simpson	£898 0 0
Coleman	780 0 0
Acock	778 0 0
Smith	777 0 0
Coils and Co.	744 0 0
Gammon	737 0 0
Soper	729 0 0
Piper	697 0 0
Myers	598 0 0

For converting Camden-town Plate-Glass Works into a forty-quarter brewery, for Messrs. Garrett, Whitaker, Grimwood, and Co. Mr. Robert Davison, engineer and architect:—

Builders.

Thompson	£1,798 0 0
Easton	1,702 0 0
Wills	1,591 0 0
Roe	1,591 0 0
Coleman	1,516 0 0
Carter (accepted)	1,469 0 0

Ironfounders.

Cockrane	£1,460 0 0
Lawrence	1,389 0 0
Grissell	1,387 0 0
Laidlaw	1,279 0 0
Garrett (accepted)	1,156 0 0

Backmakers.

Oxley	£1,150 0 0
Ramsden	1,115 14 4
Hurrell	1,106 0 0
Middleton (accepted)	990 0 0

For farm-buildings, at West Horsley, Surrey:—

Loe and Son, Guildford	£1,091 0 0
Jeffreys, Ipswich	1,060 0 0
Smith, Dickleburgh	990 0 0
Nye, Guildford (amended)	969 0 0
Moon and Son, Guildford	967 0 0
Wood, Cobham	922 0 0
Reynolds, Brighton	899 0 0
Barnes, Nutfield (accepted)	879 0 0

For buildings, Peel-grove, Bethnal-green. Mr. F. G. Widdows, architect:—

Tolley	£1,277 0 0
Sargeant	1,040 0 0
Raby	972 0 0
Sanders, Brothers	920 0 0

For the restoration of Sawbridgeworth Church, Herts. Mr. G. E. Pritchett, architect:—

Cox and Son, Lambeth	£802 14 0
Dickinson, Bishops Stortford	558 0 0
Burton, Sawbridgeworth (accepted)	541 0 0

Crowtree-lane Villa, Louth. Messrs. Bellamy and Hardy, architects, Lincoln:—

Clark, Louth	£1,698
Ryall and Son (accepted)	1,690

Restoration at Wellesley Hall, Spalding. Bellamy and Hardy, architects, Lincoln:—

Brett, Spalding	£531 0 0
Dawson	519 10 0
Moore and Son	490 0 0
Pepper and Dalman (accepted)	480 0 0

For erecting four cottages at Loughton. Mr. Wm. D'Oyley, architect. Quantities supplied by Mr. R. L. Curtis:—

Perry	£657 0 0
Pilkington	651 0 0
Bull and Son	650 0 0
Ring and Stanger	650 0 0
Martin	629 0 0
Gill	600 0 0
Rivett	595 0 0
Cushing	590 0 0
Page	550 0 0
Carter	540 0 0

For 1,290 feet of brick sewers and other works at Dalston. Mr. E. Swansborough, architect. Quantities not supplied:—

Holmes	£450 0 0
C. Macers	436 18 0
E. Macers	422 0 0
Hocken	416 0 0
Hill (accepted)	398 0 0

Repairs and alterations to be made at No. 9, Clements-lane, Lombard-street, for Mr. H. Barnes. Mr. C. G. Searle, architect:—

Axford	£637 10 6
Deacon	574 0 0
Turner and Sons	517 0 0
Taylor	514 0 0
Carter	496 0 0

For the erection of a new house and shop, to be built for Mr. Mark Sherrin, in Half Moon-street, Sherborne, Dorset. Messrs. Haggett and Pocklington, architects:—

Down	£815 0 0
Guppy	773 10 0
Hamblin and others	750 0 0
Sanell (accepted)	660 0 0

For getting out foundations and putting in drainage of Mr. Spurgeon's new Tabernacle. Mr. W. Pocock, architect. Quantities supplied:—

Green	£983 18 0
Reddin	900 0 0
Walker and Neve	853 0 0
Myers	827 0 0
Messenger and Porter	791 19 0
Widden	774 3 8
King and Howe	744 0 0
Wilson	722 0 0
Carter	705 1 4
Little and Son	693 0 0
Lavers	658 0 0
Downs	593 0 0

Middlewich Cemetery Chapels. Bellamy and Hardy, architects, Lincoln:—

	Two Chapels in blue brick facing.	Extra, if faced with Welsh stone.	Entrance Gates, Bell, &c.
Buckley	£930	£62	£180
Wilson and Jones	1,000	78	Supposed to be in the 1,000
Faram (accepted)	860	61	180